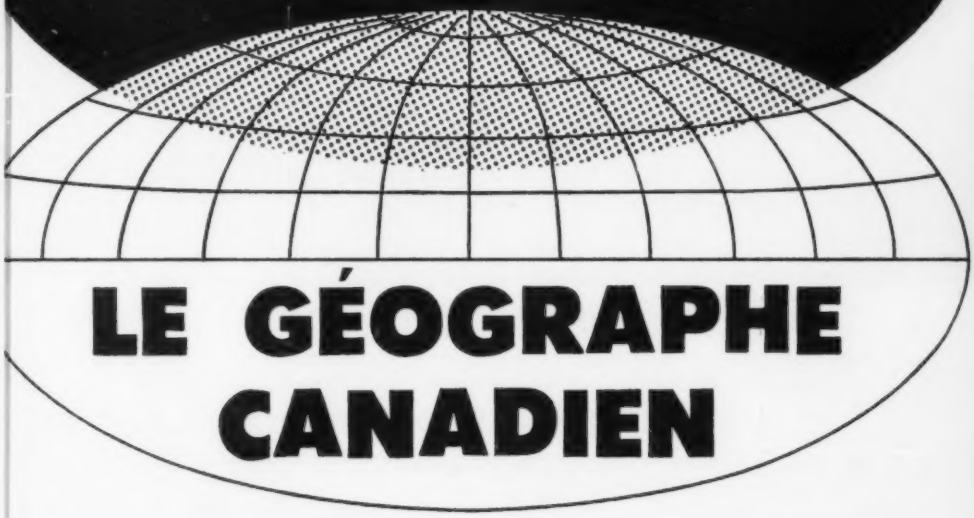
THE CANADIAN ASSOCIATION OF GEOGRAPHERS

THE CANADIAN GEOGRAPHER



LE GÉOGRAPHE CANADIEN

L'ASSOCIATION CANADIENNE DES GÉOGRAPHES

Volume V, Number 1
Spring 1961

THE CANADIAN ASSOCIATION OF GEOGRAPHERS
L'ASSOCIATION CANADIENNE DES GEOGRAPHES

Founded in 1951, the Canadian Association of Geographers has as its principal objectives the exchange of ideas among geographers in Canada, the fostering of scholarship and research in geography, and the improvement of the teaching of geography.

Full Membership, for which the annual dues are $10, is open to any professional geographer. Full-time university undergraduate students may become Student Members for $3 per annum. The annual dues for Associate Membership, which is open to any person interested in the objectives of the Association, are $7. Organizations desiring to support the Association may also apply for a Sustaining Membership at $25.

Fondée en 1951, l'Association Canadienne des Géographes a pour buts principaux l'échange d'idées entre les géographes du Canada, l'avancement de l'étude et de la recherche en géographie et l'amélioration de l'enseignement géographique.

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THE CANADIAN GEOGRAPHER

LE GEOGRAPHE CANADIEN

VOL. V, NO. 1, SPRING 1961

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A change in the numbering system of the CANADIAN GEOGRAPHER commences with this issue (volume V, number 1). Numbers 1 to 6 (1951–5) are considered as volume I; numbers 7 to 10 (1956–7) as volume II; numbers 11 to 14 (1958–9) as volume III; and numbers 15 to 17 (1960) as volume IV. For convenience, reference to these past issues should be made in accordance with the original numbering.

LE GÉOGRAPHE CANADIEN adopte, avec le présent cahier (volume V, numéro 1), un nouveau système de numérotage. Les numéros 1 à 6 (1951–5) sont considérés comme formant le volume I; les numéros 7 à 10 (1956–7) le volume II; les numéros 11 à 14 (1958–9) le volume III; et les numéros 15 à 17 (1960) le volume IV. Pour plus de commodité, les renvois aux articles contenus dans ces quatre premiers volumes devraient faire mention du numéro propre à chacun des dix-sept cahiers.

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THE CANADIAN GEOGRAPHER

EDITOR: W. G. DEAN ASSOCIATE EDITOR: G. POTVIN

THE CANADIAN GEOGRAPHER publishes professional papers and information pertaining to geography. Articles on related subjects which have geographical interest or implication may be submitted.

Manuscripts in English or in French should be submitted on 8½ x 11 inch paper. References and footnotes should be placed in numerical order on a separate page (or pages). Note that *all copy* including references and captions should be typed double-space. A summary of 250 words should accompany the manuscripts.

Maps and diagrams are to be submitted in a form that can be reproduced directly. Photographs should be clear, about 3 x 5 inches in size, and printed on glossy paper. All illustrative material should be consecutively numbered on the back. Captions and source credits should be typed on a separate page.

Manuscripts and correspondence concerning contributions should be addressed to The Editor, The Canadian Geographer, 273 Bloor St. W., Toronto 5. All other correspondence about subscriptions, back copies, etc., should be addressed to The Secretary, Box 421, Ottawa, Ontario.

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LE GÉOGRAPHE CANADIEN

RÉDACTEUR: W. G. DEAN RÉDACTEUR-ASSOCIÉ: G. POTVIN

LE GÉOGRAPHE CANADIEN *publie des articles écrits par des géographes et des renseignements se rapportant à la géographie. La revue présente également des études traitant de sujets apparentés à la géographie, qui comportent un intérêt ou offrent des applications géographiques.*

Les manuscrits en anglais ou en français doivent être soumis à la rédaction sur papier de 8½ pces par 11 pces. Notes et renvois doivent être présentés dans l'ordre numérique, sur feuille(s) séparée(s). Tous les textes, y compris légendes et renvois, doivent être dactylographiés à double interligne. Un résumé de 250 mots devra accompagner tout article soumis à la revue.

Le format des cartes et croquis doit être tel qu'il permette la reproduction directe. Les photographies doivent être claires, sur papier glacé d'environ 3 pces par 5 pces. Cartes, croquis et photographies doivent être numérotés au verso. On en indiquera les auteurs ou l'origine sur feuille séparée.

Les textes d'articles et toute correspondance se rapportant à la rédaction devront être adressés comme suit: Le Rédacteur, Le Géographe Canadien, 273, rue Bloor, Ouest, Toronto 5. Toute correspondance ayant trait à l'abonnement, à l'annonce, à l'obtention de numéros déjà parus, etc. doit être adressée au Secrétaire, Association Canadienne des Géographes, Casier Postal 421, Ottawa.

L'Association Canadienne des géographes remercie le Conseil des Arts du Canada de l'aide financière qu'il lui a accordée pour permettre la publication du GÉOGRAPHE CANADIEN. *Le fait d'accorder une subvention ne rend toutefois pas le Conseil des Arts responsable des vues exprimées dans le journal.*

LA GEOGRAPHIE DE RAOUL BLANCHARD

LOUIS-EDMOND HAMELIN

Université Laval

. . . importe-t-il de penser que toute une école de géographes lui doit d'être ce qu'elle est . . . DANIEL-ROPS, 1958

LE BIOGRAPHE n'a que l'embarras du choix pour démontrer l'importance de l'œuvre géographique de Raoul Blanchard, ce maître français qui est l'un des deux présidents honoraires de l'Association Canadienne des Géographes. Ne considérons que les événements des quatre dernières années, c'est-à-dire depuis que Monsieur Blanchard a ses soixante-dix-neuf ans ! Ce géographe prolifique qui publie depuis 1902 en est à son 279ème travail important. En 1956, il met un terme à sa magistrale série alpestre en publiant un douzième volume : *Essai d'une synthèse*, 605 pages[1]. L'année suivante, c'est au tour d'*Annecy*, 204 pages. En 1958, il reprend, en 282 pages, sa synthèse alpestre pour la Collection Les Temps et les Destins. Cette année, après une expérience nord-américaine échelonnée sur trente ans, il publie une vue d'ensemble de ses travaux québécois en présentant *Le Canada français*, en 316 pages[2]. Un autre livre sur *Nice* est en chantier.

Il est normal qu'une vie si féconde soit auréolée de certains honneurs. Au cours de cette même période de quatre ans, Monsieur Blanchard devient titulaire de l'envié prix Osiris de France ainsi que de la Charles P. Daly Medal des Etats-Unis[3]. Il entre, en 1958, à l'Académie des Sciences Morales et Politiques[4]. Puis, déjà Officier de la Légion d'honneur, il est promu dans le petit groupe de la classe supérieure. Enfin, l'Institut de Géographie de l'Université Laval lui offre, en 1959, des *Mélanges*[5], œuvre de collaboration entre le Canada, la France et les Etats-Unis.

On le voit, peu d'intellectuels auront eu une carrière aussi monumentale que celle de Raoul Blanchard, ce double géographe des Alpes et du Québec.

RAOUL BLANCHARD, PROFESSEUR

Agrégé en 1900, puis Docteur ès Lettres, Monsieur Blanchard se voit, en 1906, confier à Grenoble son premier poste universitaire d'enseignement. Cette nomination aura permis à Blanchard d'y fonder un Institut de Géographie Alpine, une excellente revue du même nom et d'y trouver des sujets de recherches.

Si c'est à Grenoble que Blanchard a donné sa plus grande mesure dans le domaine de l'enseignement universitaire, il faut dire qu'il a également donné plusieurs séries de cours dans diverses universités étrangères. Mentionnons Barcelone; puis Harvard entre les années 1917 et 1936; enfin, Montréal et Laval. Dans le Québec, sa carrière de profeseur a été une vraie conquête qui s'est jouée en trois étapes : les conférences isolées, les cours semi-publics et, à partir de 1948, quatre services d'enseignement dans les deux Instituts universitaires de géographie que dirigent ses anciens élèves. Sur le plan de l'enseignement, Montréal a reçu davantage que Québec. Les mots de Monsieur Pierre Dagenais à savoir que « Monsieur Blanchard fut le principal artisan de la création d'un enseignement de la géographie dans nos Universités » valent surtout pour l'Institut de Géographie de l'Université de Montréal dont Blanchard fut nommé premier directeur[6]. C'est ce qui appert dans une étude récente[7]. Les Canadiens qui seront véritablement marqués par Blanchard ne pourront l'être qu'à l'Institut de Géographie Alpine, en France.

A Grenoble, les sujets de cours les plus caractéristiques étaient en étroite relation avec les recherches faites tant dans les Alpes qu'à l'étranger : reflet de la profonde unité dans la carrière entière de

TABLEAU 1

RAOUL BLANCHARD EN AMÉRIQUE DU NORD

ANNÉE	ENSEIGNEMENT AUX U.S.A.	ENSEIGNEMENT DANS LE QUÉBEC	RECHERCHES DANS LE QUÉBEC
1917	Harvard, exchange professor		
1918			
1919			
1920			
1921			
1922	Columbia		
1923			
1924			
1925			
1926			
1927	Chicago		1er voyage au Canada
1928	Harvard, full professor		
1929	Harvard		Gaspésie
1930	Harvard		De Matane à Lévis
1931	Harvard		Côte Nord
1932	Harvard; North California		Saguenay–Lac St-Jean
1933	Harvard	conférences; cours Hautes Etudes Commerciales	Cité de Québec
1934	?		
1935	Harvard; Middlebury College	conférences	De Québec à Montréal
1936	Harvard	conférences	Cantons de l'Est
1937		conférences	Laurentides
1938		conférences	Plaine de Montréal; Manuels
1939			
1940			
1941			
1942			
1943			
1944			
1945		16 cours à Montréal	Montréal
1946		18 cours à Montréal	Montréal
1947			
1948		Inst. de Géogr. de Montréal	Outaouais ; Abitibi-Témiscamingue
1949		Inst. de Géogr. de Montréal	Mauricie ; Province de Québec
1950			
1951			
1952		Inst. de Géogr., Un. Laval	Province de Québec
1953			
1954			
1955			
1956			
1957			
1958		Inst. de Géogr., Un. Laval	Province de Québec

Blanchard. La morphologie glaciaire, la géographie urbaine, la géographie de l'industrie, le commentaire de cartes, la population et l'hydrologie (M. Maurice Pardé) composaient les sujets de géographie générale les plus typiques. Les « questions d'Amérique » dont évidemment la Province de Québec, le Moyen-Orient et bien entendu, les Alpes, étaient par contre des cours régionaux représenta-

tifs. Le nombre d'heures de cours par semaine était plutôt réduit.

En France, cette carrière d'enseignement dura 42 ans consécutifs; en Amérique, les 19 séjours de cours et de conférences s'étendent sur une période équivalente. Carrière fructueuse, car elle a formé à Grenoble ce qui, en un temps, a composé la moitié des professeurs de géographie en titre dans les universités de France et du Québec. Succès presqu'exceptionnel. Mais là ne se limite pas le rôle de Blanchard dont la carrière de chercheur est plus longue (60 ans) et, croyons-nous, plus marquante encore.

TABLEAU 2

CHRONOLOGIE DES ÉTUDES RÉGIONALES DE RAOUL BLANCHARD

Périodes principales	Champ principal de recherches
1900–06	Nord de la France
1908–14	Alpes
1914–29	Alpes; Asie Occidentale; front militaire
1930–39	Canada français; Alpes
1938–45	Alpes Occidentales
1945–49	Canada français; Alpes
1949–58	Alpes Occidentales
1958–60	Canada français

RAOUL BLANCHARD, CHERCHEUR ET ÉCRIVAIN[8]

Différents thèmes seront abordés au cours d'une vie de recherches qui débute avec le présent siècle. De premiers services d'enseignement dans le Nord (de la France) lancent d'abord le jeune Blanchard à l'étude de la Flandre, région qui, en 1906, deviendra le sujet d'une thèse de Doctorat ès Lettres remarquée.

Depuis la nomination à l'Université de Grenoble, Blanchard n'a cessé de publier sur les Alpes; trois périodes leur ont même été presqu'exclusivement consacrées : avant la Guerre de 1914, de 1938 à la fin de la deuxième Guerre, de 1949 à 1956; c'est précisément au cours de ces deux dernières phases qu'il a publié ses douze gros volumes sur les Alpes.

Dédoublant sa carrière de chercheur, Monsieur Blanchard commence à publier sur le Québec à l'âge de 53 ans; ici, deux périodes principales : de 1930 à 1939, de 1945 à 1949; les trois quarts des *Etudes canadiennes* ont été préparées au cours de la première période. L'on remarque inévitablement l'influence déterminante de la Guerre 1939–45 dans l'alternance des recherches alpestres et canadiennes.

Comme l'indique également le tableau 2, Blanchard a été attiré par une autre région, le Moyen-Orient, qui a permis à son auteur de dresser entre les deux guerres un tableau remarquable des pays correspondants dans la grande collection de la Géographie Universelle[9].

Ces recherches régionales, s'ajoutant à l'enseignement, avaient de quoi remplir une vie active. Blanchard, travailleur méthodique, animé d'un entrain sans usure, trouve en outre du temps pour écrire des manuels[10], des livres de vulgarisation[11], quelques livres de géographie générale[12] et un nombre vraiment impressionnant d'excellents articles variés. Cette immense œuvre est nettement caractérisée. Nous définirons plus loin sa valeur géographique; contentons-nous ici de certains aspects extérieurs. D'abord, elle illustre une méthode rigoureuse, voire même invariable[13]. Les recherches sont basées sur de nombreuses enquêtes, des interviews conduites dans toutes les classes sociales et sur un dépouillement critique de la littérature dans divers domaines. Le soin que Blanchard prend pour s'informer rend ses œuvres presqu'exemptes d'erreurs. L'auteur porte aussi une attention minutieuse à tous les aspects de la géographie générale, en particulier aux faits de géographie humaine qui peuvent être en relation avec des phénomènes physiques. Il se préoccupe sans cesse de subordonner chacun des éléments particuliers à une vue synthétique d'ensemble. Une profonde réflexion de la matière à l'étude semble donc faire intrinsèquement partie de sa méthode.

Celle-ci ne joue pas seulement sur les plans de la cueillette, de l'analyse et de la discussion des données mais aussi sur celui de la présentation. Le texte est très solidement structuré; la séquence des chapitres est la même partout : relief, climat, eaux, végétation, agriculture, industrie, commerce, habitat et population. C'est une géographie régionale mais bâtie autour de sections attendues de géographie générale.

L'explication arrive après la description; les nuances après le tableau général. Toujours trouvons-nous des introductions, des transitions et des conclusions. Les comparaisons, comme il se doit en géographie, sont nombreuses et intelligentes. De son côté, la clarté du style sert sans aucun doute le fond. Des expressions sont admirables. Rappelons de son Canada français (1960) : « les ports du fleuve ont essayé de prendre part au festin du grain ». Plus tôt, au sujet de la confluence des glaciers dans le Sillon alpin, Blanchard avait traduit la lente progression de l'appareil méridional par ces mots célèbres : « au rendez-vous de Grenoble, le glacier du Drac était en retard ». Ces expressions heureuses ne sont pas des trucs pour abuser mais une manière artistique de mieux faire voir au lecteur la réalité. Fortement structurés, bien écrits, pénétrés d'un même air de famille, voilà les premiers aspects extérieurs des œuvres de Raoul Blanchard.

Bien faite dans sa forme, la géographie blanchardienne s'est toujours voulue vaste dans son fond. L'ampleur des champs étudiés nous rappelle que « le géographe regarde de tous côtés ». Blanchard a considéré tous les aspects qu'un représentant de la "géographie régionale à la française" pouvait aborder. Par exemple, dans le dernier livre, plus de cent thèmes sont étudiés successivement; en voici six empruntés aux conditions de l'industrie : les matières premières, le réseau des communications, la fourniture de l'énergie, la répartition des hydro-centrales, l'abondance de la main-d'œuvre, les investissements. Aussi a-t-on pu dire qu'au cours de son œuvre, Blanchard avait abordé tous les sujets de la géographie générale. Quoiqu'il en soit, ceux-ci ne composent pas un champ fixé une fois pour toutes; la microstructure s'adapte aux conditions régionales; elle sait aussi évoluer avec le temps et l'on a vu Blanchard dans ses synthèses récentes consacrer quelques pages nouvelles à « l'érosion climatique » et à la psychologie. La multiplicité des thèmes étudiés aboutit nécessairement à une géographie détaillée.

Vaste est également l'aspect spatial de la géographie blanchardienne qui se divise, comme nous l'avons vu, en deux champs principaux : Alpes et Canada français et en deux domaines mineurs : Flandre et Moyen-Orient. Blanchard s'est donc soumis, et avec bonheur, à l'épreuve de la pluralité des champs de recherches. Même si cet auteur a pour lui une vitalité et une longévité exceptionnelles qui lui permettent de commencer des ouvrages à 82 ans, il reste que les dimensions « thématique » et spatiale de son œuvre ne doivent pas manquer d'étonner.

Caractérise également la géographie monumentale de Blanchard, l'effort d'intégration des diverses unités. D'un côté, l'enseignement est inséparable des recherches; nous l'avons déjà constaté sur le plan académique; ces liaisons sont tout aussi apparentes lorsque nous examinons l'itinéraire général de la carrière de Blanchard : c'est l'enseignement à Grenoble qui, sur le plan des recherches, a fait du professeur un « homme des Alpes » (Daniel Faucher); c'est également l'enseignement, cette fois, aux Etats-Unis, qui a amené Blanchard à entreprendre des recherches dans le Québec; inversement, c'est le chercheur du Canada français qui est devenu, en 1948, professeur dans les universités québécoises.

D'un autre côté, deux séries de liens à l'intérieur des recherches. Intégration verticale dans une tentative ardue et même parfois impossible de relier tous les faits du tableau géographique. Dans *La Mauricie*[14], par exemple, le lecteur « passe » des abondantes précipitations au débit généreux du Saint-Maurice, de celui-ci à la production de l'hydro-électricité; plus loin, l'énergie nous conduit à l'industrie. Mais intégration horizontale aussi. Le même ouvrage nous montre les rapports de plain-pied entre la topographie et la localisation des centrales, entre un régime hydrologique irrégulier et l'installation nécessaire de réservoirs, entre le volume énorme des eaux emmagasinées et l'aspect tabulaire du pays. Cette intégration horizontale ne joue pas seulement à l'intérieur d'un seul cadre régional mais d'une région à l'autre, nous pouvons même dire d'un champ de recherches à l'autre, en l'occurrence, Alpes et Québec méridional; dans les *Etudes canadiennes*, l'on reconnaît le Blanchard de la morphologie glaciaire alpestre et de la géographie urbaine; inversement, dans les *Alpes occidentales*, les

chapitres sur la houille blanche et sur l'industrie sentent les séjours de leur auteur en Amérique du Nord. Intégration aussi entre les géographies générale et régionale.

Il est alors capital de constater cette préoccupation d'unité dans l'œuvre de Blanchard, unité que l'on ne retrouve pas seulement dans une structure un peu stéréotypée mais surtout dans l'intention. Blanchard, même dans l'étude des pays qui n'avaient pas d'eux-mêmes beaucoup de choses en commun, a su établir entre eux le maximum des relations fonctionnelles; à plus forte raison, a-t-il habilement dégagé les servitudes visibles des combinaisons géographiques. Cette recherche des liaisons, des « interrelations », n'est pas la moindre qualité des bons géographes.

RAOUL BLANCHARD, GÉOGRAPHE

L'air de famille que l'on reconnaît dans toutes les manifestations de la vie intellectuelle de Blanchard nous condamne d'avoir distingué chez lui le professeur du chercheur, celui-ci du géographe. Ce savant s'est en effet montré partout géographe et partout le même géographe. Cette homogénéité facilitera notre prochaine tâche qui consiste à définir la géographie de Blanchard et à la situer dans l'histoire universelle des disciplines.

Avouons que, sur ce point, Blanchard aurait pu nous aider davantage. En effet, ce géographe a toujours été un peu cachottier sur les concepts et les méthodes de la géographie, répétant malicieusement qu'il était préférable de faire de la géographie que de perdre son temps à discourir sur ce qu'elle était. Il est d'ailleurs étonnant, sinon inquiétant, qu'un écrivain si prolifique se soit rigoureusement gardé de définir sa discipline. Ce n'est donc qu'indirectement, par le miroir de ses œuvres, que nous pouvons découvrir la sorte de géographie qu'il a choisi de faire.

Définir et situer la géographie de Blanchard, c'est nous jeter immédiatement dans l'insoluble problème d'une classification des optiques géographiques. Mais il faut bien nous résoudre au moins à rappeler les concepts de base. Historiquement, les idées fondamentales ont grandement évolué avec le temps[15]. Evolution d'abord dans les préoccupations : du déterminisme assommant et du possibilisme réactionnaire, l'on est passé, entre les deux guerres, à l'étude des « paysages ». L'école anthropologique a mis l'accent sur les relations réciproques entre l' « environnement » et la vie des sociétés. Réagissant contre la fonction « temps » des historiens, des géographes ont mis le cap sur l'aspect chorologique. Prolongeant une longue tradition d'étude du milieu, d'autres ont fait porter leurs efforts, d'un côté, sous l'angle écologique des phénomènes et, de l'autre, à partir d'un cadre régional. Désabusés d'un académisme un peu vide qui maintenait la géographie en dehors des réalités, certains, d'esprit plus pratique, sont en « train de mettre leur formation universitaire au service de l'action[16] »; dans le même ordre d'idée, P. Deffontaines vient même de parler d'une «géographie prospective[17] ». Enfin, recoupant toutes ces « écoles », une géographie générale, exprimant le résidu d'universel qui se dégagerait de l'examen comparatif de très nombreux exemples singuliers, s'est petit à petit constituée en branche indépendante et impérialiste.

L'évolution n'a pas été moins importante sur les autres plans. Après un objectif purement descriptif et « exploratif », l'on s'est donné un but explicatif. La méthode plus livresque du début demande maintenant davantage aux techniques du terrain et du laboratoire. De qualitative et culturelle, la géographie tend à devenir plus scientifique, quantitative[18] et de meilleure représentation graphique. L'on voit bien tout le saut que les sciences géographiques ont accompli au XX^{eme} siècle; la géographie serait devenue l'étude scientifique des combinaisons à incidence humaine qui, en état d' « interrelation » dynamique, sont sujettes à des variations spatiales[19].

Blanchard a le rare mérite d'avoir été, sur toute cette période, contemporain de ces transformations. Comment a-t-il réagi devant elles ? Constatons d'abord qu'en homme pratique il n'a guère écrit sur les mouvements d'idées géographiques comme tels; rien en lui rappelle par exemple Jean Brunhes dans ses campagnes pour « agrandir la géographie générale de sa nouvelle géographie humaine[20] ». C'est probablement une semblable attitude de non-engagement qui — à quelques exceptions près — a poussé Blanchard à faire relativement peu d'études de stricte géographie

générale, c'est-à-dire d'étude de phénomènes géographiques située à un certain niveau d'abstraction par rapport au jeu dominant du cadre local; chez lui, point de *Traité* de géographie physique comme chez son « rival », De Martonne. Jules Blache, son disciple, s'est montré en fait plus théoricien que son maître. Nous croyons exact de voir en ce rôle relativement effacé du « patron » dans les études théoriques de géographie générale le point faible de ce qu'on disait être « l'Ecole de Grenoble ». Gardons-nous cependant d'exagérer l'apparente désaffection de Blanchard pour la géographie générale car en fait ses études régionales sont présentées suivant un schéma de géographie générale (relief, climat...); il est arrivé aussi que Blanchard mène, à l'intérieur d'un cadre régional omniprésent, des discussions de grande portée et universellement valables, par exemple, sur l'érosion glaciaire et sur l'établissement de certains indices de représentation. Mais, si Blanchard a apporté une certaine collaboration à la géographie générale, ce n'est pas spécifiquement à cette branche de la géographie que l'on pourrait reporter l'essentiel de ses travaux.

La position de compromis de Blanchard en géographie générale nous indique le genre d'attitude personnelle qu'il eut devant la plupart des branches historiques de la géographie. Si nous retrouvons chez lui des éléments d'une géographie descriptive, anthropologique, chorologique, « paysagiste », explicative et de synthèse, sont absents l'approche problématique, l'aspect vraiment écologique, le travail en laboratoire, l'utilisation poussée des statistiques et de la cartographie, les aspects sociaux, la géographie appliquée. La géographie de Blanchard apparaît donc comme éclectique dans ses préoccupations et dans ses moyens.

Mais, comme l'on sait, c'est dans un cadre régional que Blanchard a toujours fait ses descriptions. Chez lui, la géographie régionale est un don reçu directement du fondateur de la géographie française, Paul Vidal de la Blache. Toute sa vie, Blanchard restera fidèle à cette formule intégrante qu'il se contentera toutefois d'améliorer. Mais cette méthode de la géographie n'est pas moins difficile à définir. Elle consiste essentiellement dans la description explicative du paysage. A. Cholley qui assujettissait à la géographie générale la géographie régionale établissait le but de celle-ci dans le « recensement de différentes combinaisons régionales[21] ». De son côté, Georges Chabot, tout en étant chagriné que la géographie régionale ne pût considérer que des cas particuliers et qu'elle n'aboutît pas alors à des lois, plaçait l'essence de la géographie régionale dans « l'étude systématique des rapports des phénomènes avec ceux qui les entourent[22] ». A la base de ce genre de recherches, se trouve évidemment la région avec des frontières mal définies dans l'espace et changeantes dans le temps; en géographie, la région est essentiellement une zone dynamique où se refont perpétuellement des états complexes basés sur de nouvelles cohésion, hiérarchisation et adaptation d'éléments singuliers. Henri Baulig ne définit-il pas les milieux géographiques comme « des champs de relations fonctionnelles, d'interactions, donc d'interdépendance, dont l'équilibre ne se maintient que par des ajustements répétés, car seuls sont durables des équilibres mobiles[23] »; pour plusieurs, la géographie générale est intimement liée à la géographie régionale. De là, il n'y a qu'un pas vers la conception d'une géographie régionale, « camp de base » et processus idéal de toute géographie.

En réalité, malgré d'admirables contributions à la connaissance du monde, la géographie régionale est demeurée en deçà de cette ambition située d'ailleurs à la limite des forces humaines. L'étude des complexes dans un cadre régional n'a jamais pu être poussée à fond. En fait, aura-t-on jamais fini d'exprimer toutes les facettes dynamiques d'une explication géographique régionale? La difficulté du sujet et l'absence de travail en équipe notamment, en empêchant la réalisation complète d'une géographie régionale ambitieuse, ont contraint les auteurs à se replier sur la sorte de géographie régionale qu'ils étaient en mesure de produire. Si l'on ajoute à ces conditions limitatives de bord, inégales chez chaque chercheur, les conceptions différentes que l'on pouvait avoir, l'on comprend que la géographie régionale ne se soit pas développée selon une formule unique; même à l'intérieur de la

France, toutes les géographies régionales ne sont pas du même modèle; la thèse de M. Derruau[24], par exemple, n'a pas le style rigide des monographies. Il reste cependant que c'est la voie abondamment illustrée par R. Blanchard qui représente la méthode la plus classique de la géographie régionale tant en France qu'à l'étranger.

Mais comprenons bien la contribution particulière qu'apporte, à la connaissance, cette façon de pratiquer le métier de géographe. Il est essentiel de retenir qu'une géographie régionale de ce type cherche à dégager une vue globale d'une région par l'application d'un choix conventionnel de préoccupations; un tel géographe régional ne considère les parties qu'en rapport avec le tout; il ne sera donc pas le spécialiste de chacun des domaines qu'il doit aborder, dans la recherche des contributions respectives des facteurs et dans celle des relations entre les phénomènes; c'est donc à tort que l'on réclame de lui des analyses très détaillées; ce chercheur n'a pas à se montrer, au cours de son étude dite de synthèse, géologue dans le premier chapitre, hydrologue dans le second, etc. Là n'est pas du tout le message du géographe. Du côté du lecteur, le spécialiste ne doit pas prendre l'attitude de ce climatologue qui se bornerait à constater que Blanchard est moins bon que lui dans l'étude systématique des temps d'hiver. Homme des ensembles, le représentant de la géographie régionale trouve son client de choix dans l'homme cultivé qui requiert des informations fondamentales sur un certain nombre de phénomènes reliés qui caractérisent une région. Tout critique qui ignorerait cette intention de la géographie régionale ne pourrait apprécier à sa juste valeur les œuvres qui s'y rapportent.

Mais cette géographie a-spécialiste au niveau des sections a, chez Blanchard, une valeur maximum. On peut dire, en effet, que la géographie régionale des Alpes et celle du Québec ont été faites chacune à deux tours : l'auteur s'est d'abord servi de cette méthode pour l'étude détaillée de chacune des régions, puis il l'a de nouveau appliquée lors de la synthèse finale (étude en bloc du territoire comprenant toutes les régions); cette seconde vue d'ensemble est, par rapport à la première, ce que le grand angulaire est, en photographie, à la lentille ordinaire; les scrupules d'un auteur qui le poussent à ne traiter l'ensemble qu'après avoir considéré une à une les parties, sont une garantie de la qualité de l'œuvre finale.

CONCLUSION

Quel avenir est-il réservé à la géographie régionale de ce type ? L'on reconnaît de plus en plus que les synthèses que l'on s'est efforcé d'établir étaient un peu hâtives et ambitieuses; elles sont plus une mise au point des connaissances globales à un certain moment qu'un exposé définitif. D'où le repli actuel vers des études régionales plus réduites; cette réduction touche à la fois la superficie étudiée et le nombre d'aspects à considérer. « De fait, on tend de plus en plus à écrire, non des études complètes, décrivant une région à tous les points de vue et sous tous les aspects, mais des études particulières, n'envisageant qu'un point de vue dans le cadre-limite d'une région[25] ». Ainsi, les champs d'examen deviennent plus réduits; les recherches pourront se faire plus en profondeur; les géographes deviendront des spécialistes d'une question, d'un problème; la clientèle des géographes va changer; ceux-ci vont probablement se revaloriser auprès des scientistes. Nous pourrons donc voir à l'avenir des géographes ne traiter, dans l'étude d'une région urbaine, que les rapports géographiques entre les unités d'un même réseau; l'on découvre alors toute la différence entre ces futurs chercheurs en « géographie urbaine régionale spécialisée » et Raoul Blanchard dont la conception était bien plus vaste; n'aborde-t-il pas successivement l'examen du site et de la situation, l'évolution des fonctions, les fonctions actuelles, la population et les paysages urbains ?

Cette tendance vers la spécialisation nous semble inévitable. Il n'y a jamais eu dans le passé qu'une seule sorte de géographe, tellement il est difficile d'englober en son entier le complexe géographique. Ainsi, à tort ou à raison, la plupart des géographes se sont repliés sur certains aspects seulement du géographique; certains se sont engagés en « géographie régionale à la française », d'autres en géographie humaine, d'autres en géographie

physique; des préférences quant à l'optique et quant au champ de recherches étaient à la base de ces groupes de géographes. Il semble bien que, dorénavant, l'intensité des études, nous dirions la « scientificité » va amener un autre clivage : à côté des géants qui préféreront s'exercer à l'établissement d'études globales à jamais parfaites, des géographes, plus modestes, ne s'attaqueront qu'à des tranches du géographique.

Apparaissent nécessaires alors ces deux types de géographes. D'un côté, il ne faudrait pas que la tendance vers la spécialisation tue l' « Ecole » de synthèse; la géographie doit garder une partie de ses troupes à l'établissement d'études régionales globales. Il serait très regrettable qu'il n'y ait plus de géographes, comme Raoul Blanchard, de type « ensemblier ». La géographie aurait perdu elle-même la caractéristique principale de l'une des plus brillantes périodes de son histoire alors que les connaissances en général perdraient définitivement l'occasion d'avoir ces synthèses régionales que certains géographes, bien plus que d'autres chercheurs, sont aptes à préparer. D'un autre côté, ne condamnons pas sans retour les études spécialisées car ce ne peut être qu'à partir d'elles que pourrait s'établir un jour la plus valable des synthèses géographiques.

C'est à dessein que nos commentaires ont voulu dépasser le cadre d'une biographie « événementielle »; la qualité de la géographie blanchardienne donnait l'occasion assez rare de situer l'étude beaucoup plus haut. Raoul Blanchard apparaît comme un géographe-écrivain qui, à l'intérieur d'un cadre régional, décrit un champ fonctionnel de faits géographiques. Peu théoricien, éclectique vis-à-vis des concepts fondamentaux, presque invariable dans sa méthode, soucieux du travail bien fait, Raoul Blanchard s'est davantage intéressé à l'étude globale des ensembles régionaux qu'à l'analyse systématique et fouillée des faits isolés. Il aura éloquemment illustré l'une des meilleures façons d'exercer le métier de géographe; Blanchard est l'un des animateurs les plus autorisés de la formule classique de la géographie régionale. Son étonnante activité intellectuelle était centrée sur deux pôles : des services d'enseignement assurés surtout à l'Université de Grenoble et la publication d'une œuvre immense, consacrée avant tout aux Alpes et au Québec méridional. Il aura été ainsi un symbole de liaisons intellectuelles entre la France, le Canada et les Etats-Unis. Chef d'école de tout ce qui s'est appelé géographie alpine[26], principal pionnier des recherches et de l'enseignement universitaire géographiques dans le Québec[27], Raoul Blanchard aura profondément marqué la géographie de langue française et indirectement la géographie occidentale.

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RÉSUMÉ

Raoul Blanchard, one of the Honorary Presidents of the Canadian Association of Geographers, has certainly made a most voluminous contribution to geography. His writing alone covers 15,000 pages, much of it on French Canada. He has also enjoyed a remarkable professional career: his teaching, mainly at Grenoble, France, and his concurrent research on the Western Alps and on the heartland of French Canada each in themselves constitute an outstanding achievement. In the province of Quebec, Blanchard's influence on the development of the field of geography has been profound.

The principal concern of this article is with Blanchard's concept of a geographer. This consideration necessitates an evaluation of Blanchard's definition of geography, the specific character of his "schools," the class of people he wrote for, as well as an examination of his methods of teaching, of research, and of writing. To do this, the writer reviews Blanchard's books with the following questions in mind: What is Blanchard's meaning of the term "géographie régionale" of which he is said to be a "maître"? Does he, during his career of sixty years, keep the same approach to his science? Is he the "perfect geographer," or simply an outstanding representative of a glorious period in the history of French geography?

A GEOGRAPHY OF ENERGY: AN EMERGING FIELD OF STUDY*

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ONE of the most striking characteristics of post-war economic development is the rapid growth of demand for inanimate energy. Many writers use energy consumption data as key indices of economic well-being and others emphasize the vital part which inanimate energy plays in permitting or attracting manufacturing industry.

The growth of demand has not, however, been equal for all sources of energy. Thus coal has been supplying a declining proportion of world energy while the share of oil and natural gas has been rising dramatically. In the production of electricity the competition between fuels and falling water is keen and some areas, traditionally reliant upon hydro-electricity, are witnessing a rapid growth of thermal generation. Such inter-resource competition varies areally in response to a variety of factors, so that there are marked regional differences in the patterns of energy consumption and supply.

In seeking fossil fuel deposits and hydro-electric sites and in the production, transfer, and processing of energy products, man creates new landscape features. At the same time he sets in motion forces which require significant social, economic, and institutional adjustments if these energy developments are to produce optimum results. Because of the necessity of ensuring adequate energy supplies and because of the increasing complexity of the energy industry and its ramifications, government control at both the national and local level has become more and more evident.

One direct result of the increasing government control is the improved and increased supply of raw data on all aspects of the energy industry. On the international level, organizations such as the United Nations and the O.E.E.C. are now regularly publishing data on the production, transfer, and consumption of all forms of inanimate energy.[1] On the national level, data are available for most of the industrial countries of the world, although the degree of refinement and the units used may vary considerably. In Canada, the Dominion Bureau of Statistics is now publishing a comprehensive range of energy data, applying for the most part to provinces and in some cases to the metropolitan areas.[2]

The fundamental importance of the energy sector of economic activity and its broad technological and social implications justify study of the energy industry by investigators from different disciplines. Most phases of the industry display characteristics which invite geographical description and analysis and, as quantitative data become increasingly available, there is a growing body of material to examine. It would seem that one need only mention such characteristics as spatial variation of energy consumption and production, the relation between the physical environment and energy supply and demand, and the regional effects of long- and short-distance transfer of energy, to arouse the interest of many geographers.

It is the purpose of this article (*a*) to review and evaluate the work of geographers in the field of energy, and (*b*) to suggest the directions along which further work might proceed.

REVIEW OF PUBLISHED WORK ON THE GEOGRAPHY OF ENERGY**

Unquestionably the most substantive and scholarly work by a geographer in this field is *Géographie de l'énergie* by Professor Pierre George, published in 1950.[3]

*The writer gratefully acknowledges the suggestions and criticisms of Mr. D. Sewell, Water Resources Division, Department of Northern Affairs and National Resources, and Mr. D. Ross, Research Dept., B.C. Electric Co., Vancouver.

**Refers largely to articles appearing in English language journals over the last 25 years.

Although it would be inappropriate to attempt an outline of this important book here, it seems certain that Prof. George's work will become a classic in the field of the geography of energy.

Data and Techniques Used

With few exceptions, geographers have been content to use energy statistics in the raw form of production units appropriate to the individual energy source, for example, tons of coal, barrels or tons of oil, cubic feet or metres of gas, and so on.[4] Little attempt is generally made to convert these figures into comprehensive units of heat or electrical energy or to deal with costs in a manner which allows effective evaluation of inter-source competition.

It is a reflection of our contentment with primitive energy data that we have done little to develop quantitative, descriptive, and analytical techniques comparable to those which have been devised in other fields of economic geography. A few simple techniques have appeared in geographical literature, but for the most part progress beyond the conventional has been made more by economists and engineers than by geographers.[5]

To date there are only a few examples of effective treatment of the relation between the physical environment and the various sectors of the energy industry, of the recognition and delimitation of regions in terms of energy-oriented criteria, or of the areal association of energy characteristics and other phenomena.[6]

Topical Coverage

The general approach of geographers in writing on the energy industry might be termed one of descriptive analysis. Within this framework geographers apparently prefer to consider one source of energy at a time. Electricity, predominantly hydro, and coal, including lignite and coke, are dealt with most frequently, followed by oil, with surprisingly little on gas, either manufactured or natural. (In estimating the relative frequency of treatment of the various sources of energy, references in which the main emphasis is upon manufacturing and resources—other than energy resources—have not been included.) Although patterns of energy supply and demand for any particular area are usually made up of a complex of energy sources both primary and secondary, few of the articles reviewed deal with the entire energy complex of an area.[7]

Most students of the energy industry recognize the several different phases which together form the link between the producer and consumer. Here again the geographer has been quite limited in his approach and only rarely goes beyond dealing with occurrence, (for example, of fuel deposits or hydro sites) and production, (for example, mine output, electricity generated). The transfer of energy has received some attention in relation to the movement of coal,[8] but movement of other energy resources is generally neglected.[9] Similarly there are few examples of works on energy processing and consumption.[10]

In terms of the scale of spatial units used by geographers in their writings on the energy industry, approximately one-half of the studies reviewed use national units as the areal basis for description. Next in popularity are intra-national regions, usually focussed upon large coalfields, for example, the Ruhr or the East Midlands coal division of Great Britain. Some small coalfields, oil fields, and hydro-electric sites have been studied intensively and, in the other direction, several studies on the supra-national and world scale have appeared.

Progress beyond descriptive analysis is not characteristic of the geographical literature in the field of energy, and consequently causal analysis and applied studies are rare. Although claims are frequently made for the locational influence of energy resources upon economic activity in general and manufacturing in particular, geographers have shown little interest in attempting to isolate or measure this influence. Also, little concern has been shown for the establishment of criteria by which energy resources may be evaluated so that some light may be thrown upon the optimum order and rate of development of resources. Similarly, studies to develop rational solutions of conflicts involving energy and other resources have not been characteristic of geographical writing.[11]

In short, the same attention has not been paid to the study of the geography of

energy as to other sectors of economic geography. The lead provided by George's work has not been followed to any extent. It is somewhat disappointing to find the contributions of geographers in this field still characterized by a relatively uncritical use of data. The emphasis has been, rather, on descriptive analysis of individual energy sources and individual aspects of the industry. However, geographers are not entirely to blame. The complexity of the industry and the scope of the problems have only emerged in recent years, while comprehensive energy data are relative newcomers to the material upon which economic geographers can draw. Furthermore, the general level of geographical writing in this field masks the individual efforts that point the way for others to follow.

SOME PROPOSED AREAS OF DEVELOPMENT

If the geographical study of energy is to advance, we must follow the examples already set by those workers mentioned, and in addition develop interests and abilities along other lines. In suggesting some directions in which such development might be guided, it is also intended to draw attention to the possibilities available to geographers in this rapidly growing area of study. The writer is keenly aware of the shortcomings of expressing himself in a semi-methodological vein without having a practical background in this field. However, these views, which at best can be considered only as tentative proposals, will, it is hoped, encourage others to share their ideas on this topic.

Basic Measurement and Techniques

Before much progress can be made in the geographical study of energy, more attention must be paid to basic mensuration in the energy industry. Because units of production vary from source to source and because one source of energy may be as good as another for many purposes, it will often be useful to develop comprehensive units in terms of heat or electrical energy, for example, Btu or kw.h. Some units of this kind have been developed and are in current use by international data-gathering organizations.[12] However, a clear understanding of their basis is necessary in order to avoid false conclusions and further, where comparisons are being made, careful documentation is required.

It is important to recognize the distinction between gross production and effective consumption of energy. Only a portion of the total energy produced is used effectively to perform work. This portion is determined by the efficiency of transportation, transformation, and application. For areal comparisons of energy consumption, use of effective consumption data constitutes a valuable refinement of gross figures.[13]

These suggestions are oriented towards studies dealing with inanimate energy. A case could be made for more penetrating investigations into the nature and contribution of animate energy and vegetal fuels to both developed and underdeveloped economies. Such investigations might well begin by measuring contributions in terms that will permit comparison with inanimate energy sources.

Beyond the quantitative measurement of significant energy values *per se*, it would appear that the geographer's interests are well suited to the use and development of derived units in which the basic energy values are expressed in relation to other items. An obvious example is the use of cost per delivered unit of energy, since an understanding of the selection between competing sources is often best obtained by analysis in these terms. Where possible, the distinction between private and social costs must be recognized and measured. The expression of gross energy production and consumption on a *per capita* basis is now commonplace, but less frequently does one see selected aspects of energy consumption expressed in relation to areal units, for example, cropland, or elements of the physical environment, as for example, atmospheric conditions. Ratios of this kind, stemming from imaginative yet informed experimentation, might well throw many aspects of the energy industry into a new light.

DESCRIPTIVE ANALYSIS

There may be a temptation to discourage further descriptive analysis in favour of more sophisticated studies. In fact there is room for much more descriptive work,

provided it deals with appropriate subject matter in sharply defined terms, qualitative or quantitative. There are numerous lines of enquiry awaiting development by geographers. Among these, four deserve emphasis:

(1) *Comprehensive treatment of the energy complex of an area.* The energy demand of an area is satisfied by the production and importation of a variety of energy sources, primary and secondary. The precise mix of production or consumption varies notably from place to place as does the balance between supply and demand. Descriptive analysis of these variations are fundamental for more penetrating studies. Initially, concern with individual sources of energy, for example, coal, hydro-electricity, is suitable, but the end product must deal with the total energy complex.

(2) *Balanced treatment of the phases of the energy industry*. The major phases of the energy industry include occurrence of resource, production, transfer, processing, and consumption. Examples of items associated with these five phases are:

(*a*) Occurrence of resource: the location of coal deposits or of potential hydro-electric sites are essentially the *neutral stuff* of E. W. Zimmerman (*World Resources and Industries*, New York, 1950). If the study is to result in significant evaluation, as distinct from reporting, careful attention must be paid to appropriate details (for example, physical and chemical character of coal, depth of overburden, thickness of seams, and so on). In other words, the technical and economic feasibility of production from each occurrence must be evaluated.

(*b*) Production: the output of a hydro-electric plant, oil or coal field or of a national electricity, coal or gas industry. Temporal and quality variations of output should be dealt with.

(*c*) Transfer: the routes followed, quantities moved by various means of transportation (expressed in both comprehensive and individual units) and morphological studies of energy transportation.

(*d*) Processing: natural gas scrubbing plants; oil refineries; coal grading, washing, and sorting stations; nuclear fuel processing plants, etc.

(*e*) Consumption: consumption mix, end uses of total energy complex and individual sources, efficiency of use.

For investigations oriented toward one energy source, such as natural gas, all phases should be considered if the study is to be complete. Alternatively the emphasis might be on the phase of the industry, for example, energy processing, and thus include the range of energy sources. The regional study requires comprehensive treatment of the various phases as well as of the entire energy complex.

(3) *Regional treatment.* Geographers have developed effective techniques for the description and analysis of the regional characteristics of manufacturing. Similar techniques using energy-oriented criteria would permit the recognition and delimitation of energy-surplus and energy-deficit regions, or of areas with particular consumption patterns either in relation to source of energy required, or temporal variation of demand.

Most energy consumption and all production appears to be highly localized. Consequently, studies are required on scales which allow examination of this areal concentration of the different phases of the energy industry, as well as broader works on supra-national scales.

(4) *Studies of the Institutional Framework*. Several geographers have already demonstrated the value of studies devoted to the company and capital control of the energy industry.[14] But there is more to be done. Studies of the interrelation between government and company policy and the development of energy resources or of public attitudes towards multi- or single-purpose developments might provide valuable insight into regional energy characteristics.[15]

Causal Analysis

After effectively describing the components of the energy industry and examining their spatial associations, the geographer must be prepared to undertake causal analysis if he is to provide a background for framing solutions and influencing policy. Such analysis must be carried out in realistic terms of the physical environment and of economic, technological, and institutional considerations.

For example, the distribution and nature of hydro-electric sites (developed and potential) can only be effectively understood when prevailing physical conditions are known. Evidently the stream-flow pattern (in turn related to atmospheric conditions and a complex of river basin characteristics) is an important determinant of the type of development required, the amount of new capacity added, and the desirability of network interconnection. The influence of atmospheric conditions on energy demand and the consequent pattern of energy distribution is another example of an area awaiting investigation by geographers.

The growth of thermal electricity in areas traditionally hydro-supplied is more clearly appreciated when viewed in terms of the increasing efficiency of thermal installations, the growing capital cost of hydro installations, and the technological lag in electrical engineering, which is delaying the long-distance transport of electrical energy at competitive cost (of oil and gas for instance). Evidently economic and technological considerations are important here.

Institutional factors are significant for an understanding of the energy industry. A major reason for the failure to develop the energy potential of the Fraser River is the absence of satisfactory institutional arrangements for resolving the fish/power conflict. Delays in the full development of the potential of the Columbia River have stemmed partially from the absence of suitable arrangements between international and intra-national interests.

Applied Studies

Objective analysis in terms such as these will inevitably enable the economic geographer to help solve practical problems of national and provincial importance. By way of illustration, one might point to the need for investigations into the locational influence of energy upon various sectors of economic activity, particularly manufacturing. Similarly, students from many disciplines, including geography, are needed to help determine social costs of developing alternative energy resources; this would aid in the solution of resource conflict problems.

In conclusion, the energy industry offers the economic geographer an opportunity for the application of his knowledge, concepts, and techniques to a relatively undeveloped field. No doubt, as the level of geographic study advances, geographers will benefit by equipping themselves with the tools and concepts of other disciplines. Judging by developments in both the physical and social sciences, inter-disciplinary extension of this kind is both necessary and fruitful. It would seem particularly appropriate for Canadian geographers to lead the way in developing a professional interest in the geography of energy, because of the unusually important part energy resources have played, and will continue to play, in our national growth.

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RÉSUMÉ

L'auteur indique que l'on peut prendre connaissance de l'évolution des études géographiques de l'énergie par un examen critique des travaux publiés sur ce sujet. Dans cet article, il propose l'adoption d'un cadre bien déterminé devant servir à l'orientation des recherches à venir. Les éléments de ce cadre sont basés sur l'observation des tendances mises à jour dans les ouvrages déjà parus et sur la considération des caractères propres aux industries de l'énergie. M. Chapman insiste tout particulièrement sur les besoins suivants :

1. L'analyse descriptive de facteurs tels que :

a) Le complexe énergétique d'une région. Les conditions de la production et celles de l'utilisation. L'équilibre entre l'offre et la demande.

b) Toutes les phases se rattachant aux industries de l'énergie: sources, production, transport, utilisation.

c) Les systèmes de gérance — entreprises privées ou gouvernementales. Développement à des fins singulières ou multiples. Méthodes préservatives.

d) La répartition des dispositifs énergétiques dans la délimitation des régions.

2. L'analyse des causes de la répartition des industries de l'énergie, comportant l'étude des éléments du milieu physique et des faits humains (e.g. technologiques, économiques et politiques).

3. Des études détaillées portant sur :

a) L'influence de la répartition des sources d'énergie sur celle des établissements manufacturiers.

b) Influence des systèmes d'administration sur l'orientation et le rythme du développement des sources d'énergie.

c) Les critères pouvant aider à déterminer les conséquences du développement des sources d'énergie sur les groupements sociaux et à trouver solution aux conflits qui s'y rattachent.

Le géographe doit faire usage d'unités de mesure incorporant à la fois plusieurs facteurs, s'il désire que son travail soit utile. Il doit également formuler des unités secondaires, où les valeurs d'énergie brute puissent être mises en rapport avec d'autres éléments (e.g. milieu physique, population, coût, utilisation du territoire, fonction manufacturière).

SOME PERTINENT FACTORS IN ENERGY STUDIES[1]

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IT IS FREQUENTLY USEFUL to be able to compare not only the amounts of energy at the disposal of various countries or communities, but also the value, expressed in simple monetary units, of the various forms of energy available. The amount of energy and the comparative cost of energy are frequently extremely important in determining the type of industry which can be planned for an area.

An economic geographer can save a lot of time if he is able to make a preliminary assessment of the economic potentialities of an area by a few simple rule-of-thumb methods, without depending too much on outside help. The remarks which follow are intended to introduce three comparatively simple concepts which the author has found useful in his own efforts to plan or assess some economic projects.

SOME FACTORS TO BE CONSIDERED IN COMPARING DIFFERENT FORMS OF ENERGY

Various forms of energy are commonly measured with different physical units. Coal is usually measured in tons, but the tons may be short, long, or metric tons. In North America, petroleum output is most frequently reported in barrels, but in most other parts of the world it is reported in tons. Furthermore, a barrel as a unit of measurement varies in amount from one part of the world to another. Unlike scientists who, because of the nature of their work, must deal in as precise mathematical formulae as possible, economic geographers may permit themselves a little latitude in making general comparisons between different types of energy.

The data on which comparisons between different types of energy are based fall into two categories: (1) tangible or reducible data, and (2) intangible or irreducible data.

1. Tangible

(*a*) *Actual Btu's contained in each unit of any commodity.* Dr. J. Davis lists the Btu content of some of the more important commodities as in Table I.[2]

(*b*) *The efficiency with which different sources of energy may be used.* Normally only a portion of the energy potentially available in any given amount of fuel can be put to effective use. Rarely can the consumer of energy obtain more than 85 per cent of what he feeds into a system, be it an industrial furnace, a domestic heating system, or the boilers of a ship. By way of example, a ship's boilers may get as much as 85 per cent efficiency from fuel oil, but only about 60 per cent from bituminous coal. Home heating plants may extract 78 per cent or better from natural gas, but only 55 per cent from coal burning fur-

TABLE I

BTU CONTENT OF SOME COMMODITIES

Commodity	Physical units	Btu content
Coal: bituminous	one ton (2240 lbs)	24–29,000,000
anthracite	" " " "	26,000,000
lignite & sub-bituminous	" " " "	14–24,000,000
Crude oil	one barrel (35 imperial gallons)	5,800,000
Natural gas liquids	" " " " "	4,000,000
Gasoline	" " " " "	5,200,000
Diesel fuel (fuel oil)	" " " " "	5,800,000
Residual oil	" " " " "	6,000,000
Natural gas	one cu. ft.	1,000
Water power	one kw.h.	3,412
Wood	one cord	20,000,000

naces, if these furnaces have no special controls. The best diesels on railway passenger trains only convert some 30 to 40 per cent of the energy in their fuel into useful mechanical energy; steam engines using coal only achieve 7 or 8 per cent on a comparable basis. Automobiles make effective use of only from 5 to 20 per cent of the gasoline they burn.

(*c*) *The efficiency with which different forms of energy can be transported.* Many consumers of energy are a long way from the sources of supply for the various types of energy in which they may be concerned. As will be seen in tables presented later, the differences between cost at site and cost at consumer's doorstep can be considerable. Obviously, the cost of transporting any form of energy from one place to another is often of crucial importance in determining which form of energy may be most economically used.

Many factors are involved in determining the means by which energy will be transported. Capital cost, flexibility in meeting varying demands, relationship between fixed and variable costs, and even such matters as political prognostications are involved in selecting any particular method for transporting energy.

Within the scope of this presentation, it is impossible to discuss all these factors. However, Davis has prepared a table on the cost of transporting energy, and since it is unlikely that any more authoritative figures will be available for several years, the table (Table II) and the comments which follow it are quoted in full here.

TABLE II

COST OF TRANSPORTING ENERGY

Form of energy	Transmission method	Distance (miles)	Unit	Cost per 100 miles (cents)	Conversion factor to Btu's (i)	Cost equivalent cost/ton/ 100 miles (ii) (cents)
Petroleum	Super-tanker	coastwise	Bbl.—34° gravity	1.0 to 1.5	6,000,000	4.5 to 6.7
	30-in. dia. pipeline	2,000	Bbl.—34° gravity	2.0 to 3.0	6,000,000	9.0 to 13.5
Natural gas	34-in. dia. pipeline	2,000	thousand cu. ft.	1.1 to 1.6	1,050,000	28.0 to 40.8
Electric power	High tension line	400	kw.h.	0.04 to 0.05	3,412	316.5 to 395.5
Bituminous coal	Railroad	1,500	short ton	70.0 to 80.0	27,000,000	70.0 to 80.0
	collier	coastwise	short ton	25.0 to 30.0	27,000,000	25.0 to 30.0

(i) These figures do not take into account relative efficiency in use.

(ii) 27 million Btu's or one short ton of coal equivalent.

Davis's comments are as follows:

The relationship between the cost of transmitting different forms of energy by various methods of conveyance are set out in the accompanying table. It shows that:

(*a*) oil can be transported more cheaply either by tanker or by large diameter pipeline than can the alternative forms of energy;

(*b*) coal moved coastwise by collier is next in line followed by natural gas. In order to make a fair comparison between these two forms of energy, certain other costs must be added where coal is concerned. This is because the solid fuels usually involve costly handling operations between the docks and the consumer's stockpile. Also, some allowance should be made for the additional costs involved in carrying coal inventories—outlays of a type which do not arise in the case of natural gas;

(*c*) coal moved by rail costs almost three times as much as by water;

(*d*) electric power is the most expensive of all these forms of energy to transport. Sight must not be lost, however, of the fact that electricity is not a raw product like crude petroleum or coal. It is already available in a highly processed, and hence more desirable, form;

(*e*) conversion efficiencies in present-day thermal plants vary. Thirty per cent

might be taken as a good round figure for future stations in the Maritimes. Therefore, in assessing the relative advantages of pithead as opposed to load centre power generation, using coal as the fuel, high tension line costs should be divided by a factor of just over three. The conclusion, then, is that the costs of transporting energy as electricity or in the form of coal by rail are comparable. However, in circumstances where the rail route tends to be more circuitous, a new main transmission line direct to the load centre may well turn out to be the more efficient of the two.[3]

2. Intangible

If dealing with intangible factors, it is much more difficult to assess the merits of different forms of energy. Obviously, there will be little uniformity, quantitatively, between various assessments. Perhaps all that may be agreed on is that intangible factors are significant. The more obvious intangibles are as follows:

(*a*) Industrial and domestic labour conditions and the availability of capital. There is a surplus of labour in many parts of the world. Considering only the efficient use of energy, it might seem obvious that one should employ more tractors and fewer people on some particular projects. Nevertheless, the country concerned might well deem it advisable to continue to use human labour. Tractors would mean capital, and capital is not always available, whereas it is frequently a problem merely to find useful work for a rapidly increasing population. In China, for instance, the building of dams with vast expenditures of human labour is common. Here again, capital is in short supply.

(*b*) Health and cleanliness. In general, the burning of hydrocarbons involves combustion which seldom is complete, and unconsumed hydrocarbons mean smoke, soot, and under some circumstances a phenomenon commonly known as "smog." Near many cities a layer of smog greatly affects the lives and health of the inhabitants of that city. Indeed, in some areas, the smog may be thick enough to cut off effectively all ultra-violet light for weeks at a time, with an almost inevitable increase in respiratory diseases, and a corresponding decrease in the efficiency of the community.

(*c*) Human cussedness. There are times and places when and where it seems impossible to explain on rational grounds some particular energy usage. Who, for instance, could justify the use of wood in a fireplace on the grounds of either efficiency or cleanliness? On the other hand, who would suggest that we do away with fireplaces, or camp fires for that matter? Efficient stoves have their place, but surely we must admit that so does the inefficient and theoretically obsolete fireplace, if only as a centre of social felicity and relaxation, and a potential source of inspiration!

If then we admit the inequalities and inexactitudes of the comparisons given below, we do have a means of making a crude estimate of the energy resources of any community, and of comparing the resources of one community with those of another. It is hoped that the ease with which these equations can be applied will more than outweigh the inequalities which may appear obvious to critical observers.

GROSS ENERGY CONVERSION FACTORS

1 ton of coal (anthracite or bituminous) = 26,000,000 Btu's
2 tons of lignite or peat = 1 ton of coal
1 ton of petroleum = 2 tons of coal
7 barrels of petroleum = 1 ton of petroleum
25,000 cu. ft. natural gas = 1 ton of coal
1 installed horse power (hydro) = 2½ tons of coal annually (i)
1 kilowatt hour from hydro = 1½ lbs. of coal per year (i)
1½ cords of wood = 1 ton of coal
150 cu. ft. or 4 cu. metres solid wood = 1 ton of coal
Average population can provide energy = 200 pounds of coal per year (ii)
A working draft animal can provide energy = 1½ tons of coal per year (ii)

(i) Davis has explained how such an equation gives hydro an inflated value. The comparison is maintained because it is believed, from a geographer's point of view, hydroelectric energy has many intangible assets relative to other forms of energy.

(ii) I am indebted to W. T. Thom, Jr., who was both courageous and stimulating in proposing the above equations. See *Trans. Amer. Geophys. Union*, 26, Part 1, August, 1945, p. 5.

Having a simple means of converting various forms of energy into tons of coal, it is now a comparatively easy matter to determine the amount of energy supplied to any given community. If this is done on

TABLE III

		1901	1911	1921	1931	1941	1951
(1) British Columbia's energy quotient, 1901–51							
Population in millions		.18	.39	.52	.69	.82	1.10
Coal (in millions of short tons)		1.63	2.54	2.90	1.90	2.00	1.80
Hydro energy capability converted to coal (millions of short tons)		.02	.30	.77	1.50	1.97	3.25
Wood converted to coal (millions of short tons)		.20	.40	.60	.79	.66	.64
Oil and gas (imported) converted to coal (millions of short tons)					1.30	1.70	
Total energy (exclusive of oil and gas) expressed as coal in millions of short tons		1.85	3.24	4.27	4.19	4.63	5.69
E.Q. (energy quotient), exclusive of oil and gas		10.3	8.3	8.2	6.1	5.6	5.2
(2) Canada's energy quotient, 1901–51							
Population in millions		5.37	7.20	8.80	10.40	11.50	14.00
Coal (in millions of short tons)		4.90	11.30	15.00	12.20	18.20	18.60
Natural gas	All expressed as coal in millions of short tons			.60	1.00	1.70	3.20
Petroleum		.20	.10	.10	.40	2.90	13.70
Wood		4.00	4.70	5.30	6.80	5.70	5.70
Water power		.60	3.50	6.80	16.70	21.20	32.60
Grand total of energy		9.70	19.6	27.8	37.1	49.7	73.8
E.Q. (energy quotient)		1.8	2.7	3.2	3.6	4.3	5.3

a yearly basis, and the amount divided by the number of people in the community in question, we come up with a simple number which is never less than 0.1, and seldom more than 10. This simple number merely represents a rough estimate of the energy, expressed in terms of tons of coal, available annually to each member of the community in question. For lack of any better suggestion, we have in British Columbia referred to this number as the "energy quotient" or "E.Q." of the country or community in question.

To illustrate the use of this term "energy quotient," two examples are given below. In these examples several forms of energy are included, but humans and draft animals are excluded because, in an industrialized society, they are of camparatively little importance. The data came largely from official government statistics, such as the *Canada Year Book*, but where necessary the author has drawn from other sources believed to be reliable, such as the *Transactions* of the Second B. C. Natural Resources Conference.[4] Although some of the wood statistics have come from reliable sources, some data, owing to a paucity of information, represent what may best be referred to as "inspired guessing" by the author.

A brief glance at example 1 (Table III) shows clearly how British Columbia is developing, and also how, in spite of a steadily increasing output of energy, until 1951 British Columbia was only able to maintain the amounts of energy available to each person by importing petroleum and petroleum products from outside the province. Fortunately, the position has changed for the better during the past ten years.

Example 2 makes it clear how and why Canada has become such a prominent contributor to the industrial output of the world. Canada's energy quotient would have been even more striking if imported energy had been included.

SOME DATA ON DELIVERED ENERGY

1. Cost of a Million Btu's

For many industries or individuals, energy is needed to provide heat. In making cement, in manufacturing pulp, and in the heating of buildings and more particularly homes, the cost of providing effective Btu's is the principal concern of a purchaser. For these purposes the cost of a million Btu's may be taken as a convenient yardstick. This cost may vary from a few cents to as much as a few dollars, or even more. In determining the cost of a million

Btu's it is necessary to know not only the Btu content of the fuel, but also the efficiency with which we are able to use the particular fuel involved. The examples in Table IV may be of interest. In order to keep the table as uncomplicated as possible, the cost of operation has not been considered. If this had also been taken into account, it would have added appreciably to the costs of the solid fuels relative to those of their competitors.

The price of fuels varies widely from place to place, but it is a comparatively simple matter to insert the costs appropriate to any locality and determine the approximate cost of obtaining a million Btu's. As has been noted above, the cost of transporting fuel is an important factor in determining the cost of delivered energy. The above examples might be taken to illustrate what energy might cost when delivered to an urban community.

TABLE IV

EXAMPLES OF THE COST OF ENERGY DELIVERED AS HEAT AT URBAN CENTRES

Type of fuel	Heating value per unit	Price of fuel per unit	Gross cost per million Btu's	Efficiency in use	Net cost per million Btu's
Coal	26×10^6 Btu's (short ton)	$10.00	.38	60%	.64
Natural gas	1000 Btu's (cu. ft.)	.40	.40	80%	.50
Fuel oil	5.8×10^6 (barrel)	3.00	.52	80%	.65
Electricity	3,412 Btu's (kw.h.)	0.07	2.06	100%	2.06
Wood	20×10^6 Btu's (cord)	12.00	.60	40%	1.50

By way of contrast, a few on-site costs are given; the difference between the costs given previously and those given below serves to emphasize the part that labour and transportation play in determining the price of energy.

The examples in Table V should serve to explain why readily available coal close to the site of use can, and in some countries does, provide cheap energy and a background for great industrial development. It is also possible to see why localities which have a supply of inexpensive natural gas can provide much cheaper energy than hydro-electric projects. Changing the energy possessed by coal, natural gas, or fuel oil into electricity involves a loss of between 75 and 60 per cent of the original energy. Nevertheless, in many locations it is possible to generate electricity more cheaply from coal or natural gas than from hydro-electric installations; in some places even fuel oil can provide electricity at less cost than a hydro-electric

TABLE V

EXAMPLES OF THE COST OF ENERGY DELIVERED AS HEAT AT SITE

Type of fuel	Heating value per unit	Price of fuel per unit	Gross cost per million Btu's	Efficiency in use	Net cost per million Btu's
Coal (lignite) strip-mined	18×10^6 Btu's	$1.50	.08	60%	.14
Coal (bituminous) strip-mined	24×10^6 Btu's	3.00	.12	60%	.21
Coal (bituminous) underground	26×10^6 Btu's (short ton)	7.00	.27	60%	.45
Natural gas	1,000 Btu's (cu. ft.)	0.10 (M. cu. ft.)	.10	80%	.12
Crude oil	5.8×10^6 Btu's (barrel)	2.50	.43	80%	.54
Electricity	3,412 Btu's (kw.h.)	0.04	1.18	100%	1.18

project. Indeed when energy is needed in the form of heat, hydro projects can seldom compete with other sources of energy. On the other hand, electricity can be turned into heat or mechanical energy with better than 90 per cent efficiency.

2. Cost of a Kilowatt Hour of Electricity

Electricity has now become part and parcel of so-called modern living in many of the more fortunate, and indeed in a few of the less fortunate, parts of the world. For electric lights, washing machines, radios, television sets, vacuum cleaners, refrigerators, and most of the gadgetry of today, the cost of electricity in terms of cents or mills per kilowatt hour is not all-important. Furthermore, in many manufacturing processes the cost of the energy which is contributed by electricity is not vital because it accounts for only a modest portion of the total cost of the finished article, commonly within the range of from one to three per cent. This type of energy is sometimes called "utility energy," a term which leaves much to be desired, because utility energy can, on occasion, be inexpensive. Usually utility energy, which represents electricity delivered to a householder, costs from ten to fifty mills per kilowatt hour, depending largely on the geographic background of the community.

However, there are a few instances where the amount and cost of electricity become decisive in determining whether or not an industry can be established in some particular locality. Some industries, as for example aluminium or titanium, are dependent on inexpensive and abundant electric energy for their existence; energy in any other form is unacceptable. The production of enriched uranium is another example of a process where cheap and abundant electricity is essential. In a few cases it is desirable to have some particularly pure product, and in these instances electricity may be invaluable. Some special steels and some metals free from any significant impurities may demand the use of electricity in their production. In these special cases, the cost of electricity may be the main factor in determining whether or not a particular industry can be economically established in a particular place. A cost of five mills per kilowatt hour may be taken as the upper limit at which these "tailor-made" industries can be considered.

Under special conditions electricity can be produced both from coal and from natural gas at or under five mills, but these special conditions are not numerous at the present time.

Hydro-electric projects which can deliver energy where it is wanted for five mills or less are likewise becoming scarce. Hydro-electric projects are only inexpensive where geographic conditions are peculiarly favourable. Only in a few rare instances do climate, topography, geology, and general economics combine to permit the development of inexpensive hydro-electric energy. There have been a few places in the world, such as Niagara Falls, where conditions have been excellent, and the results of developing such sites have been gratifying and are well known to many Canadians. A few similar sites remain to be developed; the Hamilton River of Labrador, the Upper Fraser in British Columbia, and the Inga Project in the Congo River all appear capable of producing electricity in large amounts at from two to four mills per kilowatt hour. However, politics, economics, or geographic remoteness are preventing the development of these projects at the present time.

It will readily be appreciated that, in producing electricity, the various factors contributing to the final cost of the electricity will vary widely with the varying circumstances of each project. In general, capital costs are dominant while fuel and/or operating costs are secondary in hydro or nuclear power plants. In the coal, natural gas, and petroleum generation of electricity, capital costs and fuel and operating expenses, although they may vary greatly, are of the same order of magnitude. It follows, therefore, that in nuclear and hydro-electric generating plants the interest on the capital cost of the project may be the vital factor in determining the price of the resulting electricity. In conventional fuel generating stations, the cost of the fuel and the interest on the capital cost of the plant will both help determine the cost of the resulting electrical energy.

As a convenience it may be well to remember that electric energy is only

cheap when it can be had in large quantities at a desired locality for less than five mills per kilowatt hour, and preferably for less than four. Electric energy in Canada can be produced at many locations for seven mills from coal, natural gas, or hydro. This can be sold to consumers for from eight to twenty-five mills in many communities, and at this price it can also serve many industries effectively.

The places where a combination of geographical factors permit the production of four mill electricity are few and far between. They do exist in Canada, and we would do well to cherish them and develop them in the public interest, without allowing political or other vested interests to dissipate their potential value as wealth-producing factors in our Canadian economy.

NUCLEAR ENERGY

It is impossible to participate in any discussion on energy without considering the role of nuclear energy in the future. In January 1960, during an International Panel Discussion held in Toronto on "The Future of Atomic Energy," Davis summed up the position of nuclear energy as a source of heat energy. Using information given at the Second International Conference on the "Peaceful Uses of Atomic Energy," held in Geneva, September 1958, Davis said:

> Nuclear schemes now exist for producing heat energy at a cost of around one dollar per million Btu's. Seventy or eighty cents per million Btu's are said to be possible within the next decade. But in many countries this performance is hardly good enough. Big industry in Canada rarely pays more than fifty cents per million Btu's for its source of heat. Out west and on the Atlantic coast, forty cents might be the ceiling for many years to come.[5]

At the same time Davis discussed "The Future of Nuclear Energy as a Source of Electricity." His conclusions were, in a nutshell, that it is unlikely we shall be able to get six mill electricity from nuclear power stations for many years to come.

In short, nuclear energy will undoubtedly become increasingly important in the years ahead, but for the next decade or two it will probably not provide cheap energy, either in the form of heat or of electricity.

SUMMARY

By using some simple generalized equations, it is possible to obtain a picture of the amount of energy available to any community or country. This can readily be expressed in terms of tons of coal per person per year, and the amount so determined may be conveniently referred to as the "energy quotient."

For more specific purposes it is convenient to refer to the cost of energy in the form of heat in terms of cents per million Btu's, and in the form of electricity as mills per kilowatt hour.

All of the above can be determined simply, and depend only on data which usually are readily available.

REFERENCES

1. The writer is happy to acknowledge his indebtedness to Dr. John Chapman, a colleague in the Department of Geography, and to Dr. John Davis of the B. C. Electric Co. Ltd. The former suggested that a paper of this nature might be of interest to geographers, and the latter assisted greatly in the preparation of the paper itself by going over it and suggesting many desirable corrections. Any reader who is interested in this subject should read some of the publications of Dr. John Davis, and most particularly his two publications referred to below.
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RÉSUMÉ

Jusqu'à une date relativement récente il existait peu de concurrence entre diverses formes d'énergie. En règle générale, les groupements et les individus se contentaient d'harnacher et d'utiliser l'une ou l'autre des

sources d'énergie immédiatement disponibles, comme le bois, le vent ou le charbon. Aujourd'hui, l'homme a souvent l'embarras du choix. En maintes parties du Canada il y a des groupements qui se voient forcés de choisir parmi plusieurs formes d'énergie, et les décisions sont souvent difficiles à prendre.

Chaque Canadien se doit de pouvoir répondre de manière sage ou au moins rationnelle à des questions telles que les suivantes :

a) Le Canada devrait-il exporter de l'énergie vers les Etats-Unis ?
b) Quelle forme d'énergie devrait activer telle manufacture de ciment ou telle pulperie ?
c) Quelle forme d'énergie servirait le mieux au chauffage d'un logis donné ?
d) Quels sont les avantages et désavantages respectifs des agences de contrôle publiques et privées ?
e) Une source d'énergie peut-elle être mise au service des besoins de la nation sans compromettre les intérêts locaux?

Les géographes ne peuvent pas seuls répondre à toutes ces questions, mais ils sont en mesure de contribuer largement à la tâche de fournir des réponses adéquates. Ils peuvent rendre service non seulement en mettant leurs connaissances à la disposition des compagnies et des agences d'aménagement directement intéressées, mais aussi par le moyen de leur enseignement, qui leur fournit l'occasion de renseigner le public, ce dernier étant trop souvent victime de la confusion créée par la réclame d'agences rivales.

Cet article a pour objet l'étude comparative des avantages propres à chacune des sources d'énergie qui sont présentement les plus importantes dans le monde. L'auteur use de trois barèmes : le nombre de tonnes de charbon par personne, par an; le coût de production par million d'U.T.B.; le coût de l'électricité par kilowatt-heure. Par un choix judicieux de l'une ou d'une combinaison de ces unités de mesure, le géographe peut trouver une solution à maints problèmes usuels.

VALIJOKI AND LISMA: NEW PLANNED SETTLEMENTS IN FINNISH LAPLAND

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VALIJOKI, 35 miles southeast of Rovaniemi, the capital of the Finnish province of Lapland, and Lisma, 60 miles north northeast of Rovaniemi are excellent examples of state-planned agricultural and forestry settlements. The nature and degree of planning in the establishment of these two settlements offer valuable comparisons with settlements in similar areas in eastern Canada, notably in the Ontario and Quebec Clay Belt where the climatic regime is similar.[1] Considerable research has been and is being carried out both in Ontario and Quebec, and in Finnish Lapland. These two small settlements are experiments to help provide answers to the agricultural problems facing all northern Finland. This article will examine the Finnish settlements at Valijoki and Lisma with respect to site, land-use surveys, pattern of layout, selection of settlers, planning of crops, marketing arrangements and community cohesion, using particular examples. The main details concerning land-use and subsidy programmes are compressed into tabular form where they are compared with those of the settlements at Cochrane and Abitibi.

RELIEF

The Valijoki and Lisma settlements are in "Frontier Finland,"[2] where "Modern land-making succeeds to old fashioned land breaking: land reclamation shifts its attention from deforestation to peatland cultivation."[3] Relief is 300 to 600 feet, the area being part of the low-lying peneplain which makes up over two-thirds of all Finland. The surface is characterized by gently rolling forested country on irregular, low ridges of glacial drift, separated by low-lying bog lands, parts of which have as much as 6 to 8 feet of organic matter overlying a sandy unconsolidated drift base. The major drainage systems are the Kemi River and its tributary, the Ounas River.

CLIMATIC REGIME

Finnish Lapland is covered with a mantle of snow for an average of 200 days a year. Precipitation in both the settlements considered here averages 21 inches annually. Rainfall is rather unreliable; in some years it is concentrated towards the end of the harvest season, and dry summers occur more frequently than wet. Spring begins when the daily mean temperature rises and remains above freezing, which may be as late as the beginning of June. Summer starts towards the end of June when daily mean temperature rises above 50° F., but August usually marks the beginning of autumn, after a short summer of one month to six weeks, and winter sets in during early October.

The growing season is lengthened during the long warm summer days when the effective growing period, based on temperatures of 43° F. and above, lasts from 12 to 14 hours per day. When the sun is weak and low on the horizon in the long summer evenings, plants cease development as the temperature frequently falls below 43° F.[4]

There is considerable frost hazard both in spring and in early autumn, especially over the low-lying meadows developed on the organic soils. However, these lowlands are generally planted in timothy (*Phleum pratense*) only, so that crop losses are not great. If barley is part of the crop which is caught by frost, it is harvested as green hay but the seed yield is lost. Cold winter temperatures are frequently responsible for clover rot in red clover (*Trifolium pratense*), and crown rot (*Sclerotinia borealis*), in timothy.

The glacial drift of the higher forested areas has low moisture retentiveness, while the bogs act as sponges absorbing large amounts of moisture. Consequently, settlers have concentrated on developing the bogs which provide hay, and on the low sand and gravel benches along the lower ridges

FIG. 1. The location of Valijoki and Lisma settlements.

where the water table is favourable for root crops, potatoes, and barley. The moisture regime and vegetation in the area are strikingly similar to those in the region extending northwards from Lake Timiskaming almost to the shores of Hudson Bay in Ontario.[5]

VEGETATION

Roughly 70 per cent of Finnish Lapland supports a mixed pine, spruce, and birch forest.[6] The highest and best-drained ridges are occupied by open stands of Scotch pine (*Pinus sylvestris*), while the damper slopes of the ridges extending to the edges of the bogs support spruce (*Picea excelsa*) and birch (*Betula verrucosa* and *odorata*). Dwarf birch (*B. nana*) and shrub willows (*Salix*) border the forest and grow out into the bogs.

There are three types of bog land in the area of the two settlements; these are distinguished by their vegetation cover. The first supports poor stands of stunted scrub pine and spruce, averaging 6–18 feet in height, which are useless for either lumber

or pulp, and dwarf birch, shrub willow, and blueberry (*Vaccinium myrtillus*) bushes. The second type of bog land, a heath-like formation, has dwarf birch, blueberry, bilberry (*Vaccinium uliginosum*), and Labrador tea (*Ledum*) around the margins and scattered in patches throughout. The third type is known by the Lappish term "Aapa"[7] and resembles a well-grassed, flat pastureland with scattered blueberry and dwarf birch shrubs. Little clearing is needed to produce a good hay meadow on this type. At Valijoki, the stunted pine and spruce-covered bog land and is the most prevalent type, while at Lisma the valuable Aapa type forms the basis for new settlement. Elsewhere in Lapland, along the Kemi and Ounas Rivers, grassy flood-plain meadows support the greater part of the northern population and here settlement began over a century ago.

SOILS

About 40 per cent of the cultivated land in Finland is on organic soil of some kind,[8] and in Finnish Lapland 40–50 per cent of cultivated land is of a peat type. The remainder is largely glacial drift, which is covered with a thin layer of semi-decayed organic matter ranging in depth from less than one inch on well-drained sandy gravel, to more than one foot where surface depressions assure a better supply of moisture. In the bogs, organic material may be as deep as eight feet.

Organic material makes a useful medium for hay crops after it is well-drained, although in drying it shrinks by at least a quarter. Sand and silty clay from the bottoms of the drainage ditches are gradually mixed into the peat by ploughing. Burning is avoided since fire destroys the organic material and is difficult to control. The somewhat acid, mainly organic soils require applications of lime. The addition of a sodium-, potasium- and phosphate-rich fertilizer produces excellent timothy.[9]

The sands and gravels on the lower slopes of the ridges occasionally have enough moisture to support crops. There are also scattered patches of silty clay loams which may be developed into useful soils by adding organic matter from the bogs, along with lime and fertilizer. They support root vegetables, cabbage, and barley, which will mature on the better-drained, more elevated soils, but not on the bog lands.

SETTLEMENT

Under the site conditions outlined, it is apparent why settlement has not penetrated areas remote from major rivers and roads until fairly recently. For a century, settlement has progressed according to individual initiative, mainly along the Kemi and Ounas rivers where there were suitable grassy flood-meadows. Since 1945 there has been renewed pressure on Lapland to provide settlement for demobilized soldiers and displaced farmers. The Land Acquisition Act of 1945 was designed to serve the needs of the new settlers, but its administration caused two serious problems. One was the continued fragmentation of existing river and main roadside holdings until farms became too small to be operated economically. To remedy this, an act regulating the division of farms was introduced in 1959. The second problem arose when farmers chose their own farmsteads in isolated areas. The province found it very expensive to extend to them services such as roads, winter snow-clearance, power, communications, regular milk pick-up, and school buses, all an integral part of modern settlement. The result was that careful settlement planning came to be considered a necessity.[10]

The two settlements at Valijoki and Lisma represent attempts on the part of the administrators of Lapland to approach new settlement more scientifically. They are organized so that the main buildings are situated on the higher, well-drained stony soils and along the main roads and thus services can be easily and cheaply supplied. The allocation of bog land and forest land depends on the general site and the availability of good tracts of both. Each settler's property is broken into several carefully chosen sections consisting of bog land, forest land, and scrub forest land; these are selected to provide a suitable economic basis and to make intercommunications as convenient as possible. The farms are nucleated around the area to be cultivated most intensively, and this helps fulfil social needs, as the community

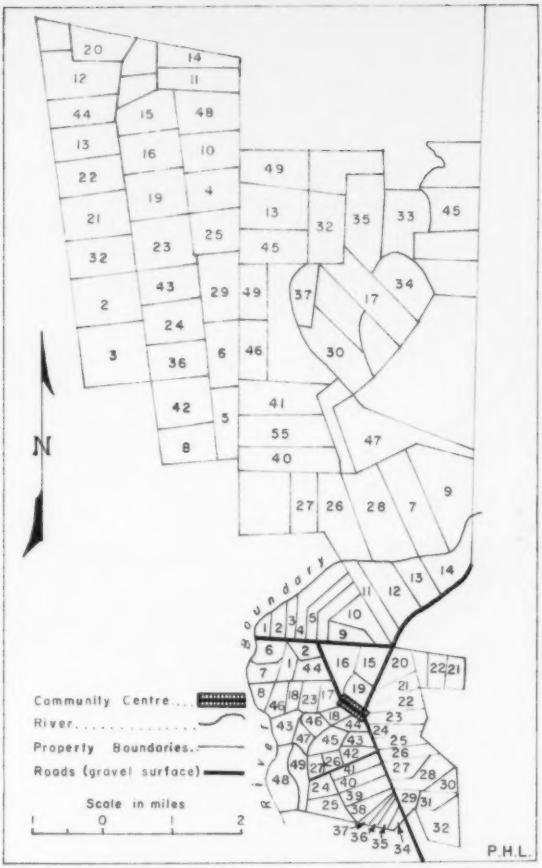

FIG. 2. Generalized map of the Valijoki settlement showing the pattern of land division. The community centre and main roads are in the more nucleated low ridge and bog land farm area. The northern part consists of good forest land. Twelve of the farms are in three separate parts; the remainder are in two parts.

has neighbours within easy reach along the main access road. A small centre, including schools with a teachers' residence, one or more co-operative stores, and a recreation area, provides a common meeting place.

VALIJOKI

The Valijoki settlement was organized in 1954 when the first agreements to settle it were signed. The settlement comprises 25,735 acres (10,500 hectares) and is designed for forty-nine farms, each with about 75 acres (30 ha.) of bog land and 200 acres (90 ha.) of forest. None of these farms can be subdivided for twenty years. The farm and its woodlot are planned to take the farmer's full time and to supply a minimum living of $1200 per year. This is expected to make labour with local pulpwood or lumber co-operatives un-

necessary. In addition, twelve lots were set aside for the school, shopping centre, and recreation area. Forty-four farms were occupied within the first five years; the average area now in cultivation by each farmer is 18 acres (7–8 ha.); one farmer has cleared 37 acres (15 ha.).

LISMA

The Lisma settlement, over 130 miles furthre north, was also organized in 1954. It is subdivided in much the same way as Valijoki except that there is a provision of extra forest land and scrub land to be administered by each farmer. The total area to be cultivated is 2859 acres (1157.56 ha.) or about 71 acres for each of the forty farms planned. By 1959, two farms were abandoned and each of the remaining thirty-eight had an allocation of 397 acres of forest land, partly designated as woodlots situated at varying distances. Further, each farm has been allotted 60 acres (24.48 ha.) of wasteland. This land is either too wet or too steep or stony to be farmed easily, but may be useful for penning cattle during the short summer. Thus each farmer has a total of 528 acres, planned so that he may be self-supporting. The woodlot is designed to provide lumber for houses and barns. Loans are given for other necessary building materials and for clearing land, as in the Valijoki settlement.

LAND-USE AND ENGINEERING SURVEY

The local agricultural representative and members of the Agricultural Engineering Service in the provincial Departments of Agriculture and Colonization in Rovaniemi plan the use and division of the land, and the location of necessary drainage systems in the untouched bog lands. Provincial funds are used to install an access road and build deep drains.

The drains are about 6 feet wide at the top, 3–4 feet wide at the bottom, and 5 or more feet from the surface depending on the local depth of organic matter. When the main drains are functioning, men are hired to dig drains 5 to 6 feet deep and 1 foot across, parallel with the main drain and about 70 feet apart, with a number of outlets emptying into the main system. Most farms in both settlements have open drains. Open ditch drainage costs the settler approximately $203 per acre (170,000 Finmarks or $531 per hectare) and $253 per acre (200,000 Finmarks or $625 per hectare) when drains are boxed and closed. It is estimated that 20 per cent of the surface area of Finnish bog farms is wasted in open drains.[11]

SELECTION OF SETTLERS

Prospective settlers are carefully selected. It is a reflection of Finnish conditions that a large number of applicants are awaiting preparation of new settlements. Many of these are well-experienced, displaced farmers from the Kuusamo region in the same climatic zone directly east of Valijoki and Lisma. Married ex-servicemen who have not previously held farms are scattered among the experienced farmers. The latter have been compensated for their land, which was transferred to the U.S.S.R., and are thus economically prepared to begin farming operations anew. At Lisma twenty-six farms were distributed according to the regulations of the Land Acquisition Bill of 1945. Fourteen were assigned to experienced farmers who agreed to co-operate with the local agrictultural representative and tabulate carefully all the results of their new experiences at regular intervals. These farms are used for experimental and show purposes.

BUILDING SUBSIDIES

Both houses and barns are built according to detailed provincial specifications and strict fire-prevention laws. Most of the frame houses contain six or seven rooms on two floors. The barns are commonly cement block stables with a storage loft above. All barns have facilities for heating water and the dairy rooms.

Loans up to $2000 are available to buy building materials for both houses and barns. These are financed at 5 per cent (3 per cent interest charge plus 2 per cent taxes) over a thirty-one year period. All lumber needs are supplied from the settler's woodlot and other materials are supplied through co-operatives. One settler considers that he may have cut too much timber for his excellent buildings, and this may leave him with less to sell as part of his living.

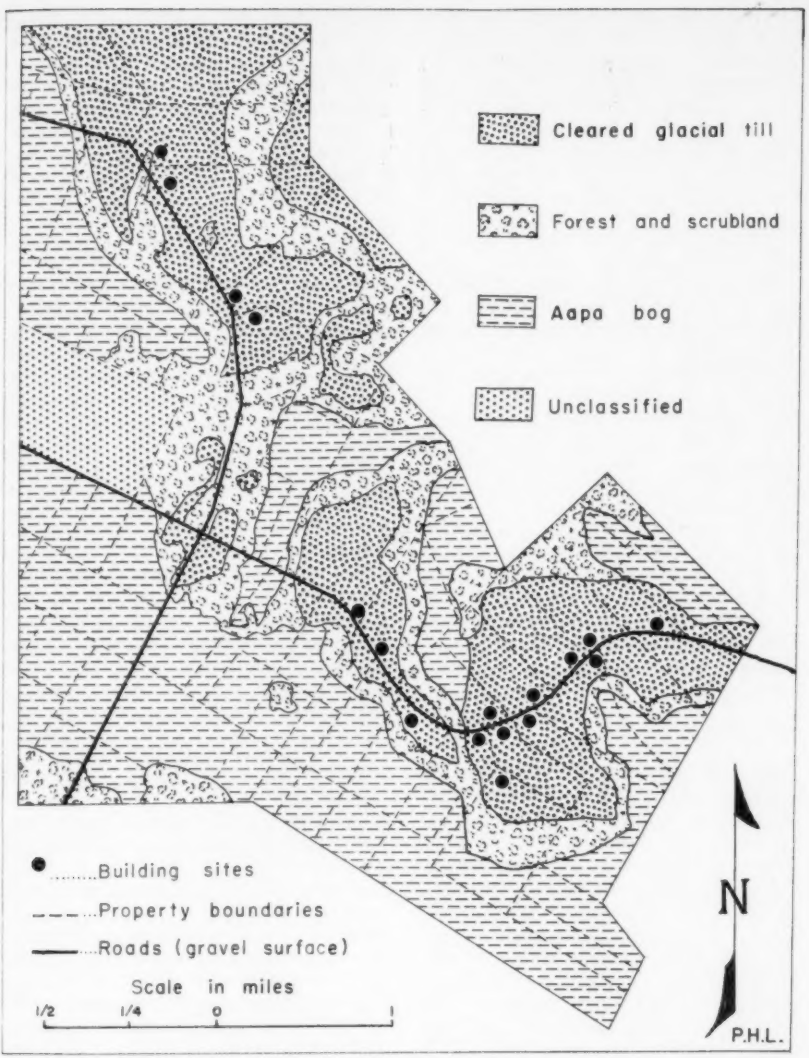

FIG. 3. Settlement pattern in the eastern part of the Lisma Aapa farm settlement.

LIVESTOCK AND EQUIPMENT

Loans repayable at 3 per cent are available from the provincial government to help buy livestock and equipment. Up to $1250 may be borrowed at these low rates to purchase equipment, lime, fertilizer, and seed. There is a special fund of up to $1900 for the purchase of a tractor, providing that it is to be used on several farms. About $475 may be borrowed to

help buy livestock; a good milk cow costs about $300. In many cases the farmer makes some of these purchases with wages earned during the draining of the bog land. As was mentioned above, displaced farmers whose land has been confiscated elsewhere have compensation which enables them to buy new livestock and equipment.

In the north the cattle are mainly of the small Finnish brown breed, which are registered according to milk production and not according to blood line. Most farmers have at least two milking cows and plan to raise or purchase others.[12] The raising of sheep was attempted at Valijoki on one farm, but all were lost to bears during the first year. Since then no further attempt has been made. A few farms have small flocks of Leghorn or New Hampshire hens. Reindeer are also herded in the neighbourhood.[13] They are owned by Finnish farmers who are descendants of much earlier settlers, as well as by Lapps.

Very little mechanized equipment is in use, since the cultivated areas are too small as yet. When a tractor specially adapted for bog farming is owned by a farmer on an experimental show farm, it is shared with others. Ploughing, rolling, and harrowing equipment along with wagons or heavy sledges are the main equipment.

MARKETING ARRANGEMENTS AND CROP PLANNING

The headquarters for a remarkably complete organization of Forest Association, Egg Marketing, Dairy, Slaughtering, Credit, and Store Co-operatives is located at Rovaniemi and Sodankyla.[14] Retail outlets for these co-operatives are located in both the new settlements, at present in temporary quarters. The central co-operative arranges for regular pick-up of milk and eggs, and the occasional pick-up of livestock, lumber, and pulpwood. The economy of each settlement has been rapidly integrated into the economy of the province. In addition, there is a determined effort to integrate the economy of the province of Lapland with that of the rest of Finland, so that dairying, one of the prime productions of the north, will not suffer competition from southern Finland where alternative products can be encouraged.

The local agricultural representative works closely with new settlers, advising them in the selection of crops, quantities to be grown, methods used, and the preparation of products for market. As yet neither settlement is in full production; however, with the present closely organized system of co-operatives and the lack of competition from other companies, it is not difficult to appreciate the contribution of the co-operatives to a remarkably successful pair of experimental settlements.

TWO EXAMPLES OF SETTLERS AND FARMS

The Heino farm at Valijoki is one of the best farms in the settlement. It has been occupied since 1954 and the owner has boundless enthusiasm for making land. A modern, well-painted home (built with a loan of $1562), a loafing barn of the newest style (loan of $1875), the traditional sauna (at present occupied by the co-operative store), and a Czech tractor are part of the tangible success on this property.

Five Finnish brown cows and four yearling heifers are kept. A small silo (10 feet in diameter and 10 feet high) is used for storing green grass, green cereal crops if the season prevents ripening, turnips (rutabaga) chopped into coarse pieces, and their tops as well as potato tops.[15] The use of silage as well as cured hay, supplemented with oilcake meal and molasses, makes it possible to increase milk production even on the small acreage under cultivation.

Probably the most important success of this family is on the human side. Both the son and daughter received a good education. The son operates a truck for the co-operatives and he, his wife, and family live with the parents. The daughter is headmistress of the nearby school and is married to a forestry worker. Not all the families can report such a happy adjustment.

The Nivala farm at Lisma supports a family with six young children, re-located from the Kuusamo region. Their large home and fine red barn were built of lumber from their own forest land and through loans of $1875 (600,000 Fm.) on the house and $1713 (550,000 Fm.) on the barn. A tractor was returned to the co-operative when payments proved too heavy. Like the other farmers in their

region, they shipped their first milk on June 11, 1959. The farm has 5 acres of barley, a quarter acre of potatoes, and 5–6 acres in hay (this is the average for Lisma). The two cows and two yearling heifers are stall-fed for over eight months. During the remainder of the year they are pastured near the farm buildings and along the road, but they still must have supplementary feeding.

GENERAL COMPARISON OF THE SETTLEMENTS

The area suitable for farming, the site conditions, and the climatic limitations are similar in Lapland, Cochrane, and Abitibi. The predominantly organic soils in these three areas provide an extensive medium for growing hay and green fodder crops, but in Lapland cereals and root crops are grown as well under conditions not unlike those of Cochrane and Abitibi.

Parts of both Lapland and Abitibi were settled as the result of extensive land-use surveys and considerable government subsidy. The Cochrane area on the other hand, was entirely settled through individual choice of farm sites, but without too much success in the past. However, when recommendations now being studied are carried out, future development may compare favourably with that of the other areas. The recommendations include a classification of land according to agricultural and forestry use, government policy for financial and technical assistance, detailed agricultural engineering surveys, planning of social facilities, synchronized development of all the necessities of a new community, municipal organizations set up to supervise government assistance, good farming practices and marketing, and sizes of farms geared to economic need.[16]

In Abitibi, rather strict adherence to the 100-acre lot even with variable terrain has been a drawback,[17] for success then depends upon the choice of a good section. Plans for farms in at least three sections, with the best land close to the centre of settlement, and larger, more economic farms were suggested for Abitibi as early as 1947.[18] Past experience has shown that settlers do not always choose the best areas, and that vegetation is not always a reliable guide to good land. Soil analysis, agricultural engineering surveys, scientific crop planning, combined with knowledge of the market, all need to be taken into consideration, and the average settler has not had the education to do this successfully.

New settlements in both Lapland and Abitibi are laid out so as to nucleate settlements and thus provide a strong sense of community from the start as well as an easier and more economical development of services. In Abitibi the Roman Catholic Church takes the initiative in organizing settlements around the church. The Cochrane district is organized on the township system so that dispersed settlement runs along the township and county roads. Future plans for the Ontario Clay Belt include the establishment of areas for primary agricultural development with settlement concentrated in one area at a time until maximum use has been made of that area and all services are well organized.[19] As yet, only in Lapland are settler holdings divided so that the desired nucleus of settlers is obtained with each having approximately the same chance of success.

In the selection of settlers, the provincial authorities in Lapland have taken the utmost care. There is a waiting list of both experienced and less experienced settlers. As Finnish people fervently wish to own their own land, they are willing to live at a bare subsistence level in order to attain it. There were similar waiting lists of servicemen wanting free land in Ontario and Quebec after 1918, but only a few had farming experience. More recent settlement in Abitibi has been the result of careful selection of settlers and careful overseeing of all settlement by agricultural representatives. In Lapland experimental show farms, over one-third of the farms in the Lisma settlement, play an important role. Less experienced farmers are carefully guided, and any experiments are definitely practical, not theoretical. In the Cochrane district, despite the provincial experimental farms, there has been the greatest failure ratio, partly because of the inexperience and loneliness of individual farmers. In 1957, only 8 of the original 124 relief settlers were still on the land in the Matheson area, and the percentages were similar around Cochrane, Kapuskasing, and Hearst.[20]

TABLE I

COMPARATIVE TABLE OF SETTLEMENT FACTS*

Finnish Lapland† 66–67.5° N.		Ontario—Cochrane‡ 47.5–49° N.	Québec—Abitibi§ 47.5–49° N.
Valijoki	Lisma		
Total area in acres			
25,735	21,159	300,767 acres subdivided into farms	800,000 acres subdivided into farms
Number of farms			
49	40	1,772	6,436
Approximate size of farms in acres			
75 bog land 220 forest	71 bog land 397 forest 60 scrubland	80 and up to 175 acres when half of the original 80 are in use	100
Cost per acre			
Uncleared land is purchased by the state and allocated to selected settlers		$0.50	$0.30
Installed by the province			
Roads, main drainage system, schools		Roads, schools, provisions for improving drainage, dredging natural waterways	Roads, main drainage, schools
Clearing			
Grant of $61–$113 per acre for clearing (average acreage under cultivation 18–25 acres)		Grant of $12 for clearing, $6 for breaking per acre up to 10 acres per year	Grant of $20 for clearing, $20 for breaking a maximum of 40 acres
Secondary drainage may be done by special mechanized equipment at $203 per acre, or installed by the settler		Clearing may be done by the settler or mechanized clearing at $35–$50 per acre	Mechanized clearing of which the settler may pay about 40% of the cost out of his land clearing premium
Subsidies for equipment, livestock, etc.			
Credits are available at 3% interest		50% of cost of drilling wells costing more than $200, maximum; not over $300	Up to $2.50 per ft. for a well up to 100′ deep, or a grant of $75 to buy pipe to put water in house, or $35 to put water in barn
$1250 to buy equipment, seed, lime, fertilizer, etc.			Maximum of $1050 credit to purchase livestock and farm equipment. The Agronomy Service gives aid in grants for buying breeding stock and lime
$1900 to buy a tractor, if it is used on several farms		Aid to farm organizations of up to $350 to buy potato graders, dusters, sprayers for use by group members	

TABLE I (*cont'd.*)

Finnish Lapland† 66–67.5° N.		Ontario—Cochrane‡ 47.5–49° N.	Québec—Abitibi§ 47.5–49° N.
Valijoki	Lisma		
$475 to buy livestock (a good milk cow costs about $300)		Payment of freight on carload lots of livestock for over 3 *bonafide* settlers	$30–$50 to buy a young bull, $15–$25 for a ram, $40–$50 for a boar, ⅓ cost of 60 chickens, ⅓ cost of a good cow, $2 per ton for limestone
Subsidies for building			
When the province has purchased the land and sells it ready for planting as at Lisma and Valijoki, loans are given at low interest: 31-year loans at 3% interest and 2% amortization, up to $4375		Under the 1916 Settlers' Loan Act, long-term loans were available for erecting farm buildings, or paying off mortgages; these were discontinued after March 31, 1936	Home-building grants of $600, plus a loan of $600, payable over 15 years, for purchase of materials at cost from the Department of Colonization to build according to specified plans
Mortgages on houses examined ranged from $1500–$1900 and on barns from $1700–$1900		Loans are available under provincial or federal farm development programmes, but must be arranged privately	Grants of up to $400 for barn buildings 34′ × 32′ and according to plans which allow for later expansion
Credit of $562 for installation of electricity			Grant of $75 for installation of electricity By the time the farm is 40% cultivated, direct cash subsidies may total as much as $4,345
Estimated annual income required			
$2,400 for a family of six, about 60% from agricultural work, and 40% for the sale of forest products		$2,500 from at least 15 milk cows, each requiring 4–6 acres for hay and pasture According to the 1950 census, only 9% of Cochrane and 6% of Abitibi farmers netted more than $2,500	
Farmers are not allowed to work away from their farms in the Valijoki and Lisma settlements, but elsewhere in Finnish Lapland farmers supply most of the labour in forestry operations. Farms in these two settlements are set up as economic units		Pulpwood cutting attracts Ontario and Quebec farmers each winter and jobs are fairly plentiful; as much as $5,000 can be earned for ten months' work with a pulp and paper company; many farmers are really part-time farmers with major income from outside work	

*Most of the qualifying conditions attached to grants and loans have been omitted.

†Figures and estimates obtained personally from agricultural representatives at Rovaniemi and Sodankyla, Finnish province of Lapland, May and June 1959, and from A. Lehtinen, Chargé d'Affaires, Legation of Finland, Ottawa, in 1959 and 1960.

‡Canadian Agricultural Census, *Dominion Bureau of Statistics*, 1956, p. 45, for total area and number of farms, and *Policy to Assist Farmers and Settlers in Northern Ontario*; Ontario Department of Agriculture, April 1, 1950, pp. 1–4.

§Canadian Agricultural Census, 1956, p. 14, and *Land Settlement Policy*; Department of Colonization, Province of Quebec.

Extensive provincial low-interest loans are available in both Finnish Lapland and Abitibi. These include subsidies to aid land-breaking and draining, building homes and barns, and purchasing livestock and equipment. But it is the provision of economic units of property in the beginning that seems to give the Valijoki and Lisma settlements the best chance of success. They also give the settler independence, as there is no intention of carrying on the subsidies for an unlimited period. Subsidies in the Abitibi area have been available for a wide variety of improvements since the earliest Gordon Plan of Settlement in 1934, the Vautrin Colonization Plan, 1935–8, and the Rogers-Auger Plan in 1936. These continuing subsidies are a major reason for the relative success of Abitibi as compared with Cochrane. However, the practice of maintaining new settlements on an insufficient economic base for a long time raises serious criticisms of the wisdom of organizing new settlements in marginal areas in Ontario and Quebec.[21] In such cases, better use of lands already under cultivation could be much more rewarding and much less expensive.

In the Lapland experiments, there are orderly arrangements for crop planning and marketing of produce. The agricultural representative assesses the market and suggests what should be grown in any one area in a particular year. There is also a mature co-operative system and none of the competition found under other systems where initiative is more individual. Integration of the new settlements into the general economy was planned at the outset. The Abitibi area compares very well with Finnish Lapland and co-operative purchasing organizations are undoubtedly important in its success. In addition, strongly centralized organizations under parish priests, who may act as local advisers for the county agricultural representative, have been successful. Experience in Northern Ontario and Quebec makes it clear that help is needed selecting crops and in preparing products for market; failing this, superior graded and packaged products from older settlements will continue to monopolize the market.[22] Future recommendations for the Cochrane area include such careful planning. However, the tradition of individual initiative among farmers in Canada has prevented the development of the kind of state organization and direction which is so important in the Finnish system.

A close sense of community is not so conspicuous in earlier Lapland settlements as in the two new ones at Valijoki and Lisma. In the latter morale is high; numerous experienced settlers provide encouragement for the others, and the outward appearance of well-painted and organized settlements inspires a sense of well-being. There is a similar sense of community in the Abitibi settlements, largely the result of the historic close-knit parish system. Lack of this sense of community may well have been a major cause for extensive land abandonment in the Ontario Clay Belt.

CONCLUSION

Permanent settlement is more feasible in well-planned, nucleated, and economically integrated settlements. To ensure success, the subsidy system must be temporary, and the settlers should have economic units assigned to them from the start. The size of these units will vary with the terrain, climate, economic system, and degree of isolation from major consuming areas.

The most sincere attempt at integration of marginal northern areas with southern areas, mainly to encourage production of the few commodities possible in the north without undue competition, is found in the new Finnish pattern of development. The successful attack on northern coniferous forest and bog land in Lapland is largely the result of great pressure on the land to provide homesteads, lack of other alternatives for those wanting to make new land, and the tradition of closely directed state planning of all phases of production.

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12. One cow gives 3800 kg. (8370 lb.) of milk and 180 kg. (400 lb.) of butter annually, and may be registered when production reaches 4000 kg. of milk at 4.5% butter fat.
13. When reindeer trespass on fenced new meadows, their owners are liable to fines. Their sharp hooves damage the surface and tramp in drains. All reindeer must be branded or earmarked to show the owner's identity.
14. For a full discussion, see WESTERMARCK, N.: *Finnish Agriculture*, pp. 65–76.
15. Storage as silage is a means of obtaining the maximum of grass and other fodder from a minimum of land, at a time when it is green and rich in protein. In the AIV method, dilute hydrochloric and sulphuric acid are added to the green ensiled mixture to keep the PH about 3. As soon as the PH rises to 7, the mixture is alkaline and rapidly deteriorates. The ensiled fodder tastes weakly acid like a mild solution of vinegar. Prof. A. Isotalo reports that nitrum bisulphate is added to make chopped turnips preserve properly in the silo. Prof. A. I. Virtanen has found that the loss of bulk in green ensiled storage is only 20% compared with up to 30% with cured hay. Also see VIRTANEN, A. I. in *Proceedings of the United Nations Science Conference on the Conservation and Utilization of Resources*, vol. VI, Land Resources, Department of Economic Affairs, United Nations, 1951, p. 347ff.
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RÉSUMÉ

A Valijoki et à Lisma, dans la Province de Laponie, en Finlande du Nord, des projets de colonisation promettent de transformer systématiquement des étendues de forêt et des marais. Les méthodes qui y sont utilisées et l'expérience qui y est acquise peuvent être grandement utiles aux régions de peuplement de la bande argileuse du nord de l'Ontario et de l'Abitibi, où les conditions climatiques sont semblables.

Il y a eu une poussée graduelle de la frontière septentrionale du peuplement agricole en Finlande et un accroissement de la marche conquérante des colons dans les étendues forestières. Dans le passé, les établissements individuels dans cette zone n'ont pas eu grand succès, car il était difficile et coûteux de procurer aux fermes dispersées certains services essentiels tels que routes, électricité, etc. Récemment, des agronomes locaux, en collaboration avec les Ministères de l'Agriculture et de la Colonisation, ont fait le choix d'un certain nombre de sites propices à l'établissement de villages organisés en agglomérations très concentrées. Après un relevé détaillé des ressources agricoles et forestières, on procéda à la construction d'une route principale permettant de communiquer le plus directement

possible avec la ville la plus proche. Cette route donne accès à des chemins secondaires aménagés pour servir une colonie compacte d'environ cinquante fermes. Les services essentiels suivent le tracé du réseau routier.

Le choix des colons est fait avec soin; certaines familles qui ont beaucoup d'enthousiasme et d'expérience sont placées à côté d'autres, plus novices, qui profiteront de l'encouragement et de l'exemple des premières. L'agronome local conseille les colons dans le choix des cultures, dans la préparation des produits pour le marché et surveille étroitement les méthodes de drainage et de culture. Dans les zones marécageuses, l'autorité provinciale établit à ses frais le réseau principal des conduits souterrains. Les édifices sont érigés d'après des plans détaillés et conformément aux lois de prévention des incendies. La Province contribue aux projets de construction par le moyen de prêts à long terme et à un taux d'intérêt peu élevé. Lorsque le village parvient à un stage de production où il peut fournir des denrées marchandes telles que du lait, des grains, du bois de pulpe ou de construction, l'écoulement de ces produits s'effectue dans les cadres de l'économie provinciale ou nationale.

Au Canada, la colonisation des territoires du Nord n'a pas, en général, reçu cette surveillance avisée qui est pourtant nécessaire pour assurer l'intégration des activitées nouvelles au complexe économique national. Cet article décrit deux colonies nouvelles situées dans la province finnoise de Laponie et présente quelques comparaisons générales entre ces dernières et les établissements du Nord de l'Ontario et du Québec occidental.

CHANGES IN SEASONAL SNOWFALL IN CITIES

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Meteorological Service of Canada

THE NEED for a discussion of changes in seasonal snowfall in cities was brought to the writer's attention early in the winter of 1959, when one of the Toronto newspapers used the headline "It can't happen again." This quotation was made in direct reference to the twenty-four–hour 20.5-inch snowfall which occurred in Toronto in December, 1944. Nevertheless, it raised the question of whether or not the growth of metropolitan Toronto in itself had really changed the city's snowfall enough to justify the headline.

It is true that large cities change the climate of their location in many ways. Such changes have been fairly adequately discussed by many authors. H. Landsberg, for example, has summarized these effects and one of his conclusions is that the building of a city generally causes a rise of 1° to 2° F. in the mean temperature.[1] This agrees with conclusions reached by M. K. Thomas on the change in winter temperature which occurred with the growth of metropolitan Toronto.[2] Besides the change in temperature, there is also a probable increase in the precipitation. According to R. Geiger, this is caused by both the upward movement of air over the city and the more numerous condensation nuclei owing to atmospheric pollution.[3]

The only published reference to the effect of a city on snowfall is the following statement by Manley based on observations in England. "It is possible that the warmth of a built-up area in winter plays some part in diminishing the frequency with which falling snowflakes will be observed in inner London. This effect, in the writer's opinion, must be small."[4] This statement does not completely agree with the newspaper heading mentioned above. However, in view of the fact that the Meteorological Service of Canada has been measuring snowfall since 1843, sufficient data should have been gathered to throw some light on this apparent disagreement.

Before examining these data, there are some features that control the amount of snowfall and should be mentioned. Changes in snowfall through the growth of a city may be brought about in two ways. Any increase in the precipitation resulting from the growth of the built-up area of a city will tend to increase the snowfall. But, an increase in the temperature brought about this way will cause some of the precipitation, which would have fallen as snow if the built-up area were much smaller, to melt and reach the ground as rain. Thus these two controls tend to cancel each other out, and the question becomes which is the more efficient.

Under ideal conditions one could determine the effect of the city on snowfall simply by taking simultaneous observations at comparable sites both within and outside the city. Unfortunately the metropolitan areas have grown in regions where such comparable sites, where all orographic influences other than the city itself are equal, are non-existent. This leaves the alternative of studying the long-term record for a single site around which a large city has grown since the record first began, and from this trying to determine if the snowfall has changed throughout the period. When this method is used, the comparability of the data resulting from measurements of snowfall over a long period must be considered. Whether there are trends in the temperature and precipitation, other than those due to the growing city, must also be taken into account.

The method of measuring snowfall in Canada has not been significantly altered since 1843. The observer is still instructed to measure the depth of the freshly fallen snow in several representative spots with a ruler, and report the average depth. There have, however, been some changes, such as the frequency of the measurements. These were generally taken at 8-hour intervals until 1932, at 12-hour intervals from

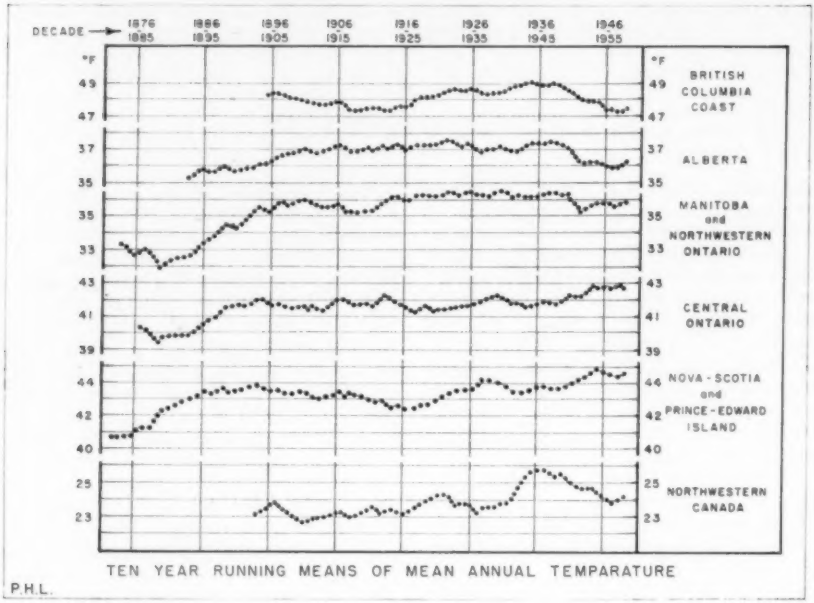

FIG. 1.

1932 to 1940, and at 6-hour intervals from 1941 until the present. As the structure of a snowflake begins to break down because of gravity, wind action, and so on as soon as it settles to the ground, one would expect the measurements to record slightly greater amounts of snowfall during the periods of more frequent measurements. Furthermore, the data may not be comparable because of the personal bias of the various observers in their selection of the points at which to make the snowfall measurements. The amount and sign of this error, of course, vary from observer to observer. Examination of snowfall data which is currently being gathered demonstrates only that the error can be considerable and may well lead to faulty conclusions about trends in snowfall. For this reason it is not proposed to subject these snowfall data to any searching statistical analysis here.

To illustrate the temperature trends in various parts of Canada since official temperatures were first observed, Figure 1 shows the graphs of the ten-year running means of the temperature for various regions. In this figure the ten-year means are plotted on the final year of the decade. Along the coast of British Columbia, there have been fluctuations of the order of 2° F. In Alberta, the decade of the 1880's was cold and the warming trend thereafter reached a maximum in the late 1940's. Colder temperatures have prevailed in the last few years. In Manitoba and northwest Ontario, the temperatures in recent years have followed much the same pattern, but there was evidently a more spectacular rise after the cold period around 1880. In central Ontario there was a rapid rise in temperatures during the latter part of the nineteenth century. This was followed by a period of fairly uniform temperatures which lasted until recent years when temperatures have been higher. The temperatures in Nova Scotia and Prince Edward Island follow the same general pattern except that there was a secondary cold period ending in 1926 in the middle of the record. It should be noted that the range

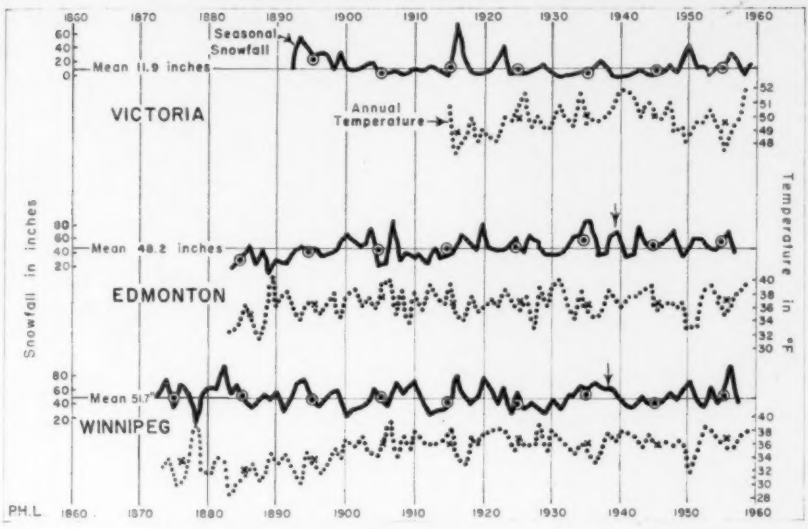

FIG. 2.

of fluctuations of the ten-year mean temperature in all these regions has been of the order of 2° to 3°F. compared to the one increase of 1°F. attributed to the city effect.

Figure 2 illustrates the first of three figures on which the seasonal snowfall (indicated by the solid line) has been plotted. The mean snowfall for each decade is indicated by a dot enclosed by a circle; the reference line represents the mean seasonal snowfall for the complete period of record. The annual temperatures, instead of being ten-year running means as shown in Figure 1, are joined by the dotted line. The average temperatures for the decade are indicated by a cross. The major relocation of meteorological observation stations brought about by the advent of aviation made it impossible to find eight records where the site had remained unchanged throughout the period of record. An arrow has been used on the graph to indicate where an observing site has moved from a city to a nearby airport.

In the case of Victoria, the observations were taken at Esquimalt prior to 1915, and since that time they have been taken at Gonzales Observatory. During the period for which the temperatures at the Gonzales site were plotted, the two decades with the coldest temperatures were also decades with above normal snowfall. Not only were the last ten years in Victoria cold, but the snowfall was greater than in any decade since 1900. In eight of the past ten winters the snowfall was above the long-term mean. Such evidence suggests that there is no likelihood of finding a decrease in snowfall at Victoria. It also illustrates that the heaviest snowfall in Victoria occurs with colder temperatures.

At Edmonton the observations were taken at a site in the city during the early years, and at the airport since 1938. During the interval from 1910 to the late 1940's, when there was above normal temperature, the snowfall remained at or above the long-term mean. With lower temperatures in recent years it has still remained high. In the earlier years at Edmonton, the coldest period on record, there was also the least snowfall. In the cold winter climates in the central area of the continent there has not been the same decrease in snowfall accompanying rising temperatures as has occurred at Victoria. The variation in the snowfall at Calgary has been similar

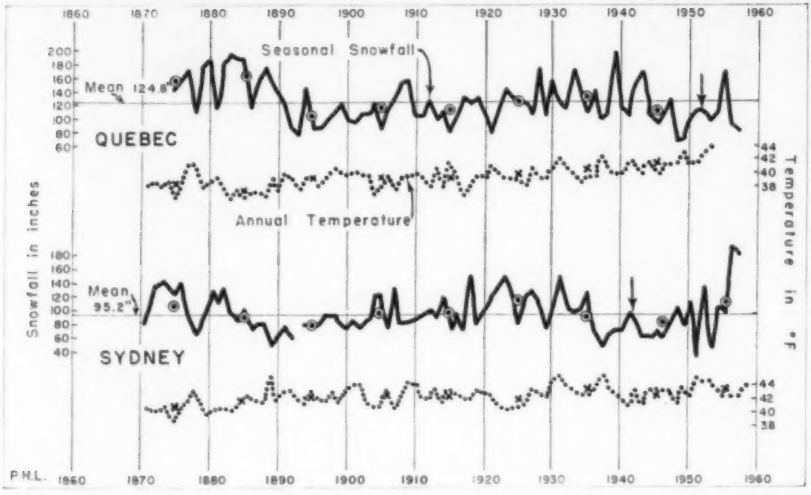

FIG. 3.

to that at Edmonton. It would seem that this is one section in Canada where the snowfall is apparently increasing.

The temperature rose sharply for a forty-year period after 1880 in southern Manitoba. At Winnipeg there appears to be a very slight downward trend in the snowfall during this period. As the temperature has levelled off during later years, snowfall has slightly increased. When snowfall records for all parts of Canada are examined, it is evident that the snowfall at Winnipeg has been the most uniform throughout the period of record, and has had the least variation from winter to winter.

At Sydney, as is apparent on Figure 3, one characteristic of the seasonal snowfall, in contrast with that of the prairie provinces, is the wider seasonal variations. Here, both the minimum and maximum snowfall on a record that began in 1871 have occurred since 1950. The two decades with the greatest snowfall were in the 1950's, when the temperature was the warmest, and in the 1870's, when the temperature was coldest. Following the 1870 decade with its increasing temperature, snowfall was at or below the long-term average until the decade beginning in 1920, when heavy snowfall again occurred with a slight recession in the temperature. Since that period the inverse relation of temperature and snowfall has not held. Snowfall seems to be more cyclic and more dependent on some control other than temperature. There is slight evidence of a long-term trend.

At Quebec, the observations were taken at the observatory on the Plains of Abraham until 1953, and then at the airport. There was a very heavy snowfall in the cold period prior to 1890, but since then, with the temperature apparently slowly rising, there has been no noticeable decrease in snowfall.

Data for Toronto and Montreal are given in Figure 4. The observing site in Toronto is at the headquarters of the Meteorological Branch at 315 Bloor Street West, and in Montreal at McGill University. It is immediately evident that they both exhibit characteristics not found in the data examined up to this point. In the cold period at Toronto around 1870, the seasonal snowfall was quite variable, but

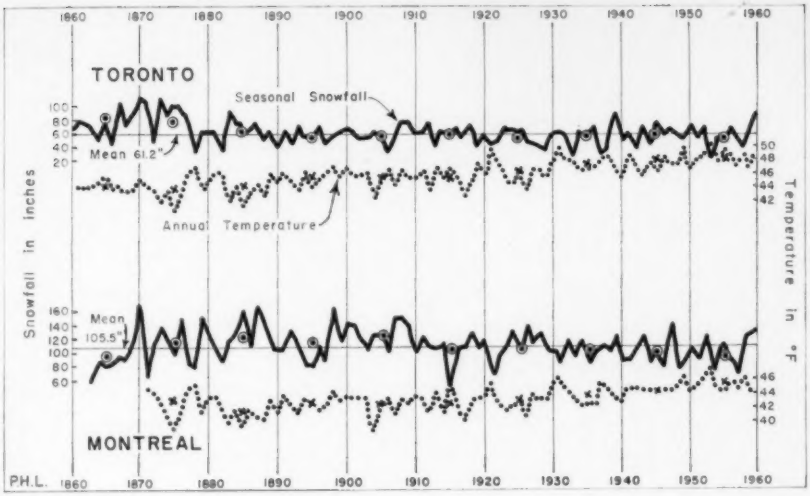

FIG. 4.

since then it has been remarkably uniform, apart from some wider fluctuations, mainly during winters with very light snowfalls, in the 1930's and in the last decade. Since 1880 there have only been three winters when the seasonal snowfall exceeded 80 inches, whereas this happened five times in the ten previous winters. At Montreal there has been a noticeable decrease in the occurrence of extremely snowy winters. Snowfalls of greater than 140 inches occurred quite frequently prior to 1910, but there have been no similar occurrences since that time.

The most striking feature of these graphs is the evidence of a definite trend to lower snowfall persisting over most of the period of record. At Toronto the greatest decrease in snowfall occurred just around 1880, with a slower rate of decrease in evidence throughout the remainder of the record. At Montreal the sequence of occurrences has been slightly different. Snowfalls in the decades beginning in 1880 and 1900 were the greatest on record there, but since 1910 there has been a remarkable downward trend in amount.

When trend lines are fitted to the data for Toronto it is found that the snowfall is decreasing at the rate of 22 inches per century when the complete record is used. As has been mentioned, it is evident that a great deal of this decrease occurred during the period around 1880. If a trend line using only data for the eighty years since 1880 is used, the rate of decrease is lowered to only 6.3 inches per century. For the complete period of record at Montreal, the trend in snowfall is decreasing at the rate of 14 inches per century. However, as has been stated previously, most of this decrease has occurred in the period since 1910. When a trend line is based on only the last fifty years of the record, it is found that snowfall during that period has been decreasing at a rate of 28 inches per century.

In conclusion, from the data presented it is clear that at Edmonton and Winnipeg the seasonal snowfall trend is steady or increasing slightly. This increase, however, may be due to the greater frequency of observations, as was pointed out above. In the maritime climate of the West Coast, where the temperature is more critical in determining whether or not precipitation falls in the form of rain or snow, the snowfall has varied inversely as the temperature, and has reflected temperature cycles. These temperature cycles are great enough to

cancel out any influence the city of Victoria may have had on snowfall. On the East Coast at Sydney, and also at Quebec City, the snowfall has varied throughout the period of record. Part of this variation is due to the changes in temperature, and part is likely due to changes in the total winter precipitation caused by varying storm patterns. The only definite downward trend in the amount of snowfall has been at Toronto and at Montreal. These two cities are particularly favourable sites for such a trend to develop. Both the general warming trend in temperature which has persisted fairly uniformly for almost eighty years throughout the region, and the rapid growth of the metropolitan areas, would facilitate such a downward trend.

If this trend is carried into the future, it should be determined how much of it has been due to the general rise in temperature, and how much to the warming caused by the growth of these two metropolitan areas. In a paper titled "Is Our Snowfall Decreasing?" and delivered at the 1958 Annual Meeting of the Eastern Snow Conference, Richard Ashely[5] discussed the long-term trend of the snowfall at the Blue Hill Meteorological Observatory at Milton, Mass. (This site has remained relatively unchanged over the period of record and has not been surrounded by metropolitan development.) At the Blue Hill Observatory the last thirty-six seasons averaged 2.5 inches less snow than the first thirty-six seasons on record. During the same periods the decrease in the snowfall at Toronto has been 4.4 inches. Thus, in comparing the Toronto and the Blue Hill trends, it could be concluded that the general warming trend in the Toronto region and the warming due to the city itself have been about equally efficient in inducing the decreased snowfall. While the city effect is permanent, the general temperature trend is not, and a reversal in the general temperature trend would again increase the snowfall, but to only approximately 2 inches less than it would have been without the city.

In attempting to extend the snowfall trend in Montreal into the future, there is more difficulty. The rate of decrease in snowfall in the past fifty years seems too large to be explained simply by increased temperatures. In my opinion it has been a combination of a warming trend caused by the city reinforcing the general rise in temperatures, plus a change in winter storm patterns and precipitation. Since it is possible only to forecast that one of these three conditions, the city effect, will remain relatively unchanged in the future, it does not seem reasonable to use the trend over the past fifty winters to forecast future changes in Montreal snowfall.

The headline "It can't happen again" was mentioned in the introduction. As has been argued above, the probability of extremely heavy snowfalls in metropolitan areas is decreasing. Even so, the writer of the caption had the same difficulty as any other forecaster issuing a forecast. During the winter of 1959 his forecast for the non-occurrence of an extremely heavy snowfall in a single day proved accurate, but the *total snowfall* for the past winter was greater than for any winter since 1882.

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RÉSUMÉ

L'expansion urbaine modifie le climat en favorisant l'accroissement des températures et des précipitations atmosphériques moyennes. Cet article présente une étude des effets du développement urbain sur les précipitations neigeuses par l'examen des données statistiques de plusieurs années pour quelques villes canadiennes. On peut observer une diminution des chutes de neige à Toronto et à Montréal seulement. L'auteur explique ce phénomène en l'attribuant (1) à un changement général du climat et (2) à l'expansion urbaine.

THE WOODLAND–OAK PLAINS TRANSITION ZONE IN THE SETTLEMENT OF WESTERN UPPER CANADA

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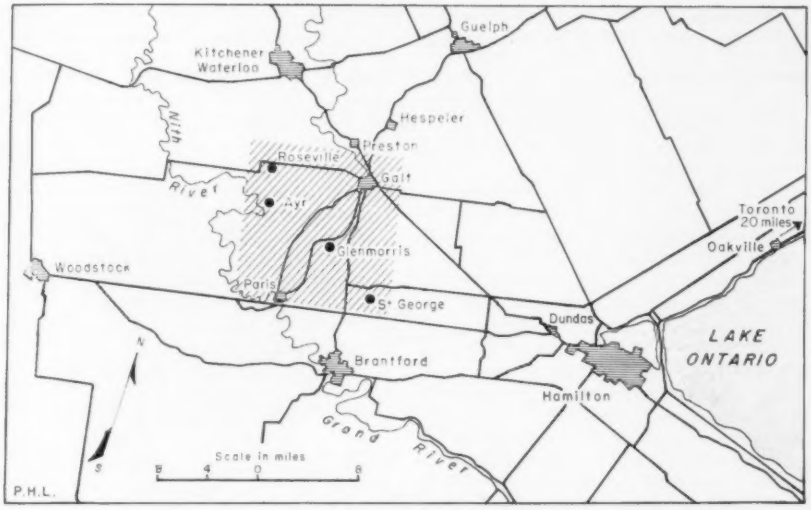

FIG. 1. Location map: Dumfries Township.

THE NOTION that settlers avoided open land in favour of land on which a healthy stand of trees was growing is prevalent in North American history. This observation is valid for the prairie fringe, where timber and good drainage were at a premium, and where a dislike of the open prairie had developed. But in the eastern woodland, where it was always possible to see across the open spaces, one would expect to find the settlers' reponses less opposed—and perhaps even somewhat attracted—to these natural openings.

The most pertinent information for an investigation of this question is to be found in the notes made by government surveyors, as they traversed the pre-settlement countryside, laying out the huge checkerboard on which the exciting contest of settling was to take place, and recording the incidence of marshes, streams, tree-types, open patches, and squatters. The notes for Dumfries Township (surveyed in 1816–17; see Figure 1) are used here as an illustration. Dumfries was divided into twelve east-west concessions, each twelve miles long by one mile wide (the northernmost was one mile and a quarter wide); it comprised 465 rectangular plots of land, each containing approximately 200 acres. The notes made by the original surveyor (Adrian Marlett) were theoretically restricted to the concession lines being plotted, but, as any student of the land surveying in Upper Canada knows, these surveyors were thoroughly familiar with the whole countryside they traversed. Marlett's familiarity is obvious from his notes.[1]

This essay is an attempt to clarify the following related questions, specifically as they applied to Dumfries Township: (1) the precise importance of woodland to the

settlers; (2) the opinions of settlers about the oak "plains" or "openings"; (3) the influence of the oak plains on the first settlement roads; (4) the woodland–oak plains transition zone and the earliest settlements.

THE IMPORTANCE OF WOODLAND TO THE SETTLERS

There was probably no other material, apart from food crops, which was as vital to the welfare of the settlers as timber. Among its uses were housebuilding, heating and cooking, construction of a "corduroy" roadway through damp land, and the laying down of a solid roadbed for better-class roads. In addition, the woodland harboured a great variety of game, and it protected the farmsteads against the full force of inclement weather. But it is faulty to deduce, on the basis of utility, that settlers in the eastern woodland sought

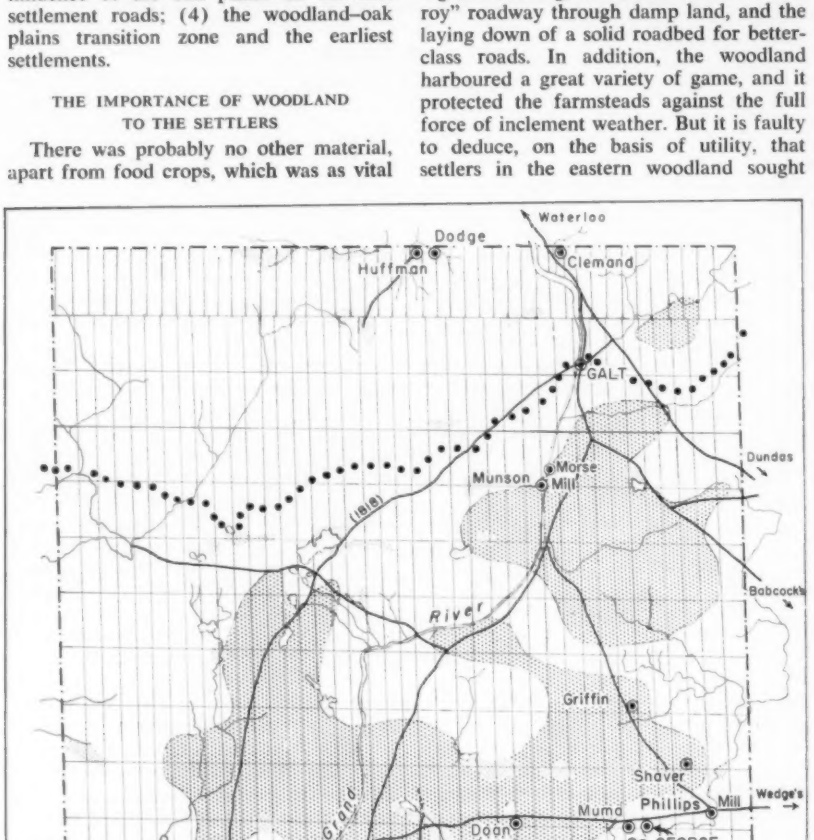

FIG. 2. Selected information from Marlett's survey notes on Dumfries Township (1816–17). (1) is the generalized line dividing a dominance of deciduous types (south), in the forest cover, from that of coniferous. (i) represents what Marlett called "an improvement," i.e. an abandoned farm site. In addition to oak plains and meadows, lot lines, roads, and settlement of 1818 are included (the road blazed in 1818, on the west side of the Grand, and the new site of St. George, are from sources subsequent to Marlett).

wooded sites for their farmsteads when open sites were available. It must be admitted that some settlers did this, probably through misinterpretation of information, or through misinformation itself. In Dumfries Township, for example, it can be shown that a small group of Highland Scots actually decided in favour of the wooded land in the northeastern corner. But it may be suspected that they were chiefly attracted by the rolling hills rather than the trees, and by the proximity of the main roads (see Figure 2). On the other hand, there were Scots in the township (Lowlanders), especially those who had been in America long enough to acquaint themselves with the rural traditions, who were not anxious to acquire land on which trees predominated.[2] This latter attitude, it would seem, was the most typical, and it is significant that those of the migrants who knew the country best (i.e. those born, or at least reared, in North America) looked not for wooded land, but for the wiser combination of an easily available supply of wood with fairly open, flat land.

OPINIONS OF SETTLERS ABOUT THE OAK "PLAINS"

For the sake of clarity, the nature of the oak plains themselves should be defined. Marlett's descriptive terms included "fine oak plains" and "open plains"; besides oak there were commonly other trees, including hickory, chestnut, and poplar. The surface of the "plains" was at times "uneven," or actually "broken and stony," but, in reference to Upper Canada, their description as "plains" was not unsuitable. The quality of the vegetation varied from areas of single, well-spaced oaks, separated by open land which had a low cover of grasses and bushes, to rather rough land covered in scrub vegetation in which poplar was particularly common. A Scottish farmer, travelling through western Dumfries Township, described the plains in these words: "we entered upon an extensive range of open, grove-like woodland, principally oak, and the trees so dispersed as not to interfere materially with . . . the plough."[3] There was a broad and varied transition zone separating the woodland from the oak plains. This zone was entirely within the extensive portion of the township which Marlett designated as sandy land. Reference to the recent Ontario Soil Survey map shows that the present-day description is "coarse loam."[4]

Oak plains similar to those of Dumfries Township occurred throughout the southern part of the Great Lakes basin, and reports of unforested patches have come from as far east as the Atlantic seaboard.[5] The explanation for these openings has not been resolved, but the most promising line of research would seem to be into the attempts of the Indians to clear land through repeated burnings.

As for the opinions of the settlers, there may be a case for saying that there was an aversion to unforested land on the prairie fringe, where the usefulness and scarcity of timber made it a precious commodity.[6] It may also be true that some groups of settlers were suspicious of the treeless openings in the forest further east.[7] It was definitely a problem in the early settling, before suitably designed ploughs had been acquired, to cut and turn a well-developed grass sod so that it could be used for cultivation. Furthermore, trees were recognized as valuable gauges of the condition of the land, certain types indicating good land, while others indicated sour or damp land.[8,9] Finally, it was believed by many (with some reason) that on flat land where marshy areas occurred fever and ague were more prevalent.[10]

But what real importance did these notions have in the minds of the pioneers in Dumfries Township? There are no known written statements made during the settlement of the township to the effect that the open land was to be avoided. Rather, it appears that a suspicion of the treeless land hardly entered the settlers' minds. As for ploughing the oak plains, it was probably possible by 1815 to secure a plough which would, with some effort, break up the sod satisfactorily. Using types of trees as gauges of the condition of the land was a technique too localized to be of much interest among settlers moving on to 100- or 200-acre plots, which embraced all kinds of land. Marshy areas, harbouring fever-bearing insects, were fewer in number on the plains of Dumfries than in much of the rest of the township, which is extensively covered by rolling glacial moraine. The

strongest argument that can be offered here is a positive one: the earliest settlers in Dumfries Township, and these the squatters (i.e. the people who had searched until they found what they considered the best possible site, without reference to superimposed lot lines), chose their land in the broad transition zone between the woods and the plains, where they had at their disposal a convenient mixture of open land with patches of forest. Whether or not the oak plains, as farm land, were good or bad is a question which was probably little entertained by the settlers who flooded into Upper Canada.

THE INFLUENCE OF THE OAK PLAINS ON THE FIRST SETTLEMENT ROADS

The correlation between the roads in Dumfries Township in 1818, and the oak plains shows that the plains had a considerable influence over the location of the roads. The correlation is illustrated in Figure 2. It might be claimed that the majority of the roads preceded settlement in the township, being cross-country roads linking isolated settlements with mills or the Lake Ontario markets. But the validity of the correlation still holds, because most of the roads shown apparently had been Indian trails. The settlers, on arriving, were happy to find even an overgrown trail, for they realized that it would follow a wise and useable route. It can be postulated, then, that the settlement roads continued to utilize the plains, until a township administration was organized. After this the roads were constructed along the surveyed allowances.

A note about the mapping of this material is necessary for clarity. Marlett's notes were the chief source. When the number and location of Marlett's checkpoints are assessed, it can be seen that the roads could take courses little different from those shown in Figure 2; thus the correlation holds true. Apart from eliminating the necessity for cutting trees, the plains were of a kind of ground suitable for road-building. They were underlain mainly by coarse loam or sandy soil, had good natural drainage, and a lesser incidence of swampy land than most other sections of the township.

THE WOODLAND–OAK PLAINS TRANSITION ZONE AND THE EARLIEST SETTLING

The outstanding phenomenon which comes to light when the survey notes are projected on to a map, is that all the settlement existing in the township at the time of the survey (except for Clemand's "improvement" on the Waterloo-Dundas Road) was located in the transition zone between the wooded land and the oak plains or in the meadowland. The meadowland is included with the plains because, although the area of meadow was smaller, the phenomenon was similar. The settlers on meadows were on the northern boundary of the township, and their choice of site was probably made for reasons similar to those of the settlers further south. The meadows were associated with valleys, and were likely to have been mainly water-meadow.

As far as can be ascertained, the squatters (or "unofficial settlers") had almost all come into the township in 1814 or 1815, that is, about two years ahead of the main influx of settlers who bought land. Most of the squatters came originally from the northern United States.[11] Figure 2 indicates that there were seven settlers, named by Marlett, who had established themselves on the fringe of the oak plains, viz: Doan, Muma, Shaver, Griffin, Phillips, Munson, and Morse (Phillips and Munson were mill-operators as well as farmers). In addition, there were two remains of "improvements" (Lot 14, Con. III; Lot 6, Con. XI), that is, former farm sites from which the inhabitants had moved on. In the transition between the woodland and meadows there were two settlers, Dodge and Huffman, and one "old improvement" (Lot 36, Con. XII).

There is a variety of evidence suggesting that these first settlers in the transition zone were serious pioneers. Such evidence includes the maintenance of the roads they found, the opening of new roads (e.g. from Phillips' mill to Galt), the initiation of the village of St. George (*ca.* 1816), and the building of the first school in the township. The appellation "professional pioneers" could not apply to these people, because they had not bought the land in the first place, and thus were not free to resell it. But subsequent events showed that they

were permanent settlers in the township, and some of them provided notable leadership. Above all, they were wise in the ways of American farming, as the continuing prosperity of their district proved.

CONCLUSION

The settlement in the transition zone between the woodland and oak plains was effected not through motives of opportunism or laziness, but simply through the good pioneering sense of the settlers, who realized the tremendous advantage of the woodland–open land combination. The dislike of the open land, which was to develop in the later settlement of the prairie fringe in the mid-western states, was almost unknown in the settlement of the eastern woodland. Although the oak openings and oak plains were regarded with curiosity by the settlers, they were seldom avoided.[12] As the details of the land-taking in Upper Canada become more familiar, one may expect to find that wherever the choice included the transition between forested land and open land, the pioneers most experienced in American conditions chose this transition zone.

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RÉSUMÉ

Le peuplement de la zone de transition entre la forêt et les chênaies découvertes n'a pas été dicté par l'opportunisme ou la paresse, mais simplement par le bon sens des pionniers qui surent saisir l'importance des avantages de la combinaison forêt-parc. On ne rencontre pas encore, durant la période de l'occupation de la forêt des régions de l'Est, cette répugnance pour les espaces libres qu'éprouveront plus tard les colons de la frange orientale des prairies du mid-west. Bien que les chênaies découvertes, de dimensions restreintes ou vastes, fussent des phénomènes quelque peu inusités aux yeux des premiers occupants, elles ne suscitaient aucune aversion chez ces derniers. A mesure que des données plus détaillées sur l'occupation sélective du territoire du Haut-Canada deviendront disponibles, on pourra sans doute observer que là où il existait une zone de transition entre forêt et parc, les colons connaissant le mieux les conditions du milieu nord-américain choisirent de s'y établir.

THE OPINION OF A CANADIAN SCIENTIST ON GEOGRAPHY IN CANADA AND THE U.S.S.R.*†

("Vzglyady Kanadskogo Uchenogo Na Geografiyu v Kanade i SSSR," V. P. Kovalevsky, *Izvestiya Akademii Nauk SSSR, Seriya Geograficheskaya*, 3, pp. 135–7, 1960)

Translated by R. M. BONE

Geographical Branch, Ottawa

THE NAME of a leading Canadian geographer, Professor Trevor Lloyd, is well known to the Soviet geographical public. During his trip to the U.S.S.R., Professor Lloyd acquainted himself with the work of our geographical institutions. In 1958, at the annual meeting of the Association of Canadian Geographers, of which he was president 1957–8, Professor Lloyd presented the paper, "The Geographer as Citizen."[1] In this paper which was published in the CANADIAN GEOGRAPHER, Trevor Lloyd attempted to indicate to the geographers of Canada, the basic direction of work which could be of great benefit to their country. Here the state of contemporary Canadian geography and some questions of its practical application are discussed, as well as Trevor Lloyd's impressions of Soviet geographical institutions.

Canadian geography is relatively young and, to a significant extent, was founded under the influence of European and American geographers. In the organization of lectures and departments of geography in universities, the French geographers, J. Brunhes and R. Blanchard, the English geographers, D. Kimble and Tatham, and Anglo-Australian geographer, Griffith Taylor provided notable assistance. The youthfulness of Canadian geography is noted and Trevor Lloyd points out that, until 10 years ago, the Canadian Association of Geographers did not exist; the oldest department of geography in the country was formed less than 25 years ago; and only since 1947 has the Geographical Branch in Ottawa existed.[2] In Canada it is possible that with this youthfulness of science there is an opinion that ". . . geographers should be content to confine their efforts to the classroom, the drawing office, and the library, there to assemble basic data garnered by more specialized and enterprising scientists from other disciplines."[3] Trevor Lloyd vigorously objected to such an attitude for geography. A significant part of his paper was devoted to providing evidence that field work was not only a responsibility of geography but that (here he refers to the field work of the Geographical Branch), by working in the field, one could obtain the best results. The work of the Geographical Branch has provided interesting material not only for the physical geography of the separate parts of the country, but also for the preparation of several construction projects in northern Canada.

Concerned with geographical investigations which have a national economic significance, Professor Lloyd, characterizing their deficiencies, notes that the majority of Canadian geographers concentrate their attention on the study of a relatively small territory. This, he observes, in the first instance, is a peculiar economic geography. As presented by him, such a reproach can

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†Mr. Kovalevsky's quotations of Dr. Lloyd's statements have been traced to the original article, "The Geographer as Citizen." Since these quotations often differed slightly from those in the original article and since Kovalevsky sometimes condensed Lloyd's sentences, the original statements in "The Geographer as Citizen" have been placed in the quoted portion of this translation of Kovalevsky's critique.

ED. NOTE: Because of the inevitable differences in shades of meaning in the translation of one language to another, the editor trusts no misunderstandings will arise from unintentional misinterpretations.

be attributed with equal success to the economic geography of the U.S.A.—especially, the utilitarian approach to geographical questions, where separate studies of small areas which are concerned with the orders of private firms, commercial wages in cities, municipalities, and so on, are reflected in the majority of journal articles and dissertations of American geographers. According to the opinion of Professor Lloyd, as a result of too slow a departure from studies of small areas, Canadian geographers take very little part in Royal Commissions[4] and other works which they could accomplish, as well as commission studies, in other specialties. "The newness and youth of the geographical profession here is of course one reason for the modest contribution made so far but it is not a good reason for future inactivity," writes Trevor Lloyd.

At the present time, the Canadian Government conducts important investigations for the interest of monopolies in the underdeveloped regions of Canada. It assumes the expenses of transportation construction and gathers and processes information concerning resources; that is, it paves the way for the penetration of private capital to these areas. In such investigations, not the least purpose is to provide a service to the Department of National Defense. Although for the last 10 to 15 years, the development of northern regions in Canada has progressed well, the character of the development naturally is distinguished by the absence of planning, the lack of a single aim, and the absence of co-operation between separate branches. This radical deficiency is noted by Professor Lloyd: "there has been, it seems to me, far too much 'individualistic' development of the northern part of Canada without due regard for the betterment of the community as a whole. Weather stations were located to meet the needs of one service rather than as scientific stations for many branches of learning, police posts for administration, trading posts for trading only."[5]

Professor Lloyd writes that the participation of geographers in settlement and urban planning, and developments of new areas can alter this relationship. "Here again there is, or should be, ample scope for geographers to pool their talents with administrators and with other scientists so that the coming development of northern Canada may be reasonably orderly and may not place an unjustifiable burden on those more southern communities which must meet the cost."[6]

Trevor Lloyd sees the second field of activity for geographers in the schools. "I suggest," says he, "that the time has now arrived for us to study the situation in our schools anew and to concentrate effort on possible ways of improving it."[7] The article reports a sharp deterioration of geography in Canadian schools. The majority of school children know less geography than business. Geography suffers not only from the absence of attention but also from teachers who do not present contemporary geography. Canadian schools and textbooks, which are written by teachers who are not professional geographers, are not organized for geography. In many schools, geography in general has disappeared, dissipated in a new subject, Social Studies. "But it never seemed to me," says Lloyd ironically, "that sound educational theory required one to spray young minds with a random sample of history (especially constitutional history), place-name geography, primitive economics, sociology, and current events (made up largely of newspaper chit-chat), the whole spiced with a warm glow of civic virtue."[8] The results of the intrusion of this subject, an export of the U.S.A., are such that now almost all "agree that the children have in fact learned little good history and less geography. It must have been extraordinarily difficult to bring up a generation quite so devoid of elementary knowledge of the 'earth and those that dwell therein', but the pedagogues seem to have achieved it."[9]

Professor Lloyd thinks that in recent times there has been a remarkable reduction in the importation of educational ideas and that at the first opportunity "Social Studies" must be repatriated. He calls upon professional geographers to engage actively in strengthening schools and to raise significantly the preparedness of geography teachers.

Professor Lloyd calls for supporters to strengthen international connections between geographers of various countries. He asks Canadian geographers to approach

the evaluation of various societies and social appearances with scientific objectivity, that is, without preconceived opinions and judgments. "In this connection," he writes, "we need to be particularly careful to remember that all the world's sinners have not been, by some mysterious alchemy, concentrated between the Elbe River and the Shanghai Bund."[10]

Regarding his impressions from his trip in 1957, to the U.S.S.R. and the Peoples' Democratic countries, Lloyd mentions the exceptionally warm receptions rendered to him everywhere. Concerning Soviet geographical education he says, "academic standards at schools and universities are in no way below those in North America, and in some ways are superior."[11]

Lloyd notes that, in middle schools, geography (in Russia)[12] is significantly better than in Europe. In unusual detail Lloyd pauses on the question of the preparation of specialized geographers in universities. Along these lines, he, from his point of view, emphasizes two principal advantages of our system of training—regional specialization of students, and sensible and well-organized field work. Perhaps, in all, more attention should be given to industrial practice. "One of the lessons which we may usefully learn from the educational methods of our Soviet colleagues is the value of giving all serious students of geography first-hand personal experience with a wide variety of landscapes, considering the cost a normal part of the expense of a good professional education."[13]

Concerning the final results of such an education, Trevor Lloyd recalls with the greatest respect: "The profession of geography is highly esteemed in the U.S.S.R. and I came away with the impression that its members well deserve the status they have achieved. At my lectures, in many interviews, on visits to laboratories and classrooms, Soviet geographers struck me as being alert, well qualified, most anxious to keep themselves fully informed about developments in their fields abroad, and ready to let us know of the results of the projects they are themselves engaged on. Study of their many published reports reveals significant work of high quality."[14]

In the latter part of his address, Trevor Lloyd expresses hope for an exchange between Canada on the one hand, and the Soviet Union and countries of the Peoples' Democracies on the other hand, of geographical students, scientific workers, teachers, scientific literature, and so on. Considering that, with these questions, there must be national organizations, he proposed that the Canadian Association of Geographers as well as Canadian universities establish direct contacts with corresponding establishments in the U.S.S.R. and countries of the Peoples' Democracies. It is necessary to hope that the appeal of Professor Lloyd will be heard, and that business-like connections, promoting mutual understanding between the two peoples, will develop.

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2. The Association of Canadian Geographers was formed in 1951, but up to this time a separate branch of the Association of American Geographers existed. (Translator's note: There was never a single branch of the Association of American Geographers for the whole of Canada.) The first Department of Geography was founded under the direction of Griffith Taylor at Toronto in 1936. The Geographical Branch first began to operate its own unit under the Department of Mines and Resources. In 1951 the Branch's Department was changed to the new Department of Mines and Technical Surveys. The Branch was in charge of important work, particularly in northern Canada.
3. Lloyd: The Geographer as Citizen, p. 2. Translator's footnote.
4. National and provincial Royal Commissions are created to investigate a definite series of problems, chiefly of an economic character. Material for them are prepared from various participants and government organizations. The most interesting are presented, for example, from materials of the Royal Commission on the economic perspectives of Canada. On the basis of 330 reports the commission has prepared summaries of the reports and 34 surveys concerning transportation, energy, mining, agriculture, and so on.

5. LLOYD: The Geographer as Citizen, p. 8. Translator's footnote.
6. *Ibid.* Translator's footnote.
7. *Ibid.*, p. 3. Translator's footnote.
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11. *Ibid.*, p. 10. Translator's footnote.
12. The words enclosed in the brackets are those of the translator. This statement appears to be based on a misunderstanding. Lloyd's original article does not include this statement.
13. LLOYD: The Geographer as Citizen, p. 3. Translator's footnote.
14. *Ibid.*, p. 11. Translator's footnote.

COMMENT

TREVOR LLOYD

MR. BONE'S translation illustrates what happens when a Canadian visitor to the Soviet Union reports on some aspects of his impressions and the account is summarized and published in the U.S.S.R. Such an indirect approach to readers in the Soviet Union might be expected to reflect less than the whole truth, or at the most an impression deprived of any vividness it might originally have had. For, as I do not speak nor understand Russian (to my continual shame and embarrassment, be it said), my initial understanding may have been incomplete. The need to condense what I reported in English into a limited space, and to exchange for my rather colloquial English the Russian appropriate to an important scientific journal, left room for added confusion.

So I am happy to relate that I do not complain about being misquoted; or about selective quotation or calculated misrepresentation. Far from it. Dr. Kovalevsky has obviously set out to do an honest and scholarly piece of scientific reporting and he has on the whole been notably successful. That the text contains phrases which when rendered into English sound unfamiliar to Canadian ears (such as "The Canadian government conducts important investigations in the interest of monopolies. . . .") is due largely to the variation in ideas and customs of speech between our two countries. They are all within the latitude which must be allowed a translator writing for a particular audience.

Had I even suspected that my sometimes offhand comments on a journey, which was at the time unusual for a Canadian geographer, were to receive close attention in the U.S.S.R., I might in places have expressed myself differently. As I was facing a Canadian audience, I directed myself to them alone.

In any event I am most grateful to Dr. Kovalevsky and to his chief, Academician I. P. Gerasimov, for giving my comments a wide audience in their country. Such exchanges of views between us are all to the good. Even if neither of us can as yet feel that "Tout comprendre c'est tout pardonner," we are moving in the right direction.

It may be well to emphasize that the visit to the Soviet Union mentioned in my report was that of March–April, 1957. It was undertaken as a private venture at my own expense and aimed at learning what I could about work being carried on by Soviet geographers and polar specialists. That my reception was a warm one was all the more pleasant because I was an uninvited guest with rather haphazard plans. Following a second visit, this in January–February, 1960, to attend the Congress of the Geographical Society of the U.S.S.R., and renewed contacts with Soviet geographers at the I.G.U. Congress in Stockholm in the following August, I have found no reasons to modify what was originally written in 1958.

Obituaries

JOAN MARGARET GOODFELLOW

THE TRAGIC DEATH of Joan Goodfellow in early July, 1960, during the course of field research in northern Canada, has come as a great shock to all those who had the pleasure of her acquaintance. Her wide range of interests, great energy, and cheerful personality placed her in the respect and affection of all her colleagues. Born in Campbellton, N.B., December 28, 1932, she received her B.A. in history from the University of New Brunswick in 1953. The same year she began studies in geography at Clark University, receiving her M.A. in 1955. In 1959 she completed the residence requirements for the Ph.D. at the University of Toronto. Her thesis research was on the historical development and present trends of land utilization in the Maritime provinces, particularly the Bay of Fundy marshlands, a subject which always held her keenest interest. During the past seven years she explored a variety of fields: a year in town-planning research with the Alberta Department of Municipal Affairs (1956–57), two summers as lecturer in geography at the University of New Brunswick summer school (1957 and 1958), and several summers in research with the Geographical Branch in Ottawa. Returning to the Branch in the spring of 1959, she began preparing terrain analysis studies of parts of northern Canada. Her interest in geomorphology and her office research in northern areas led to her participation in the 1960 summer field party along the northern shores of Great Bear Lake, where she met her untimely end.

[CHARLES RAYMOND]

ANNEMARIE KRÖGER

ANNEMARIE KRÖGER, born on July 4, 1925, was the daughter of Mr. and Mrs. W. L. C. Kröger of Hamburg, Germany. She received her early education in Germany and after specializing in geography came to Canada in 1951. Two years later she joined the Geographical Branch, Ottawa, and worked there in agricultural geography. In 1954 she registered as a graduate student in the Department of Geography at McGill University, where she showed an increasing interest in geomorphology. Although she returned to the Geographical Branch in the following year, she left it after a few months to join a northern terrain study project at McGill. As senior research assistant, responsible for the interpretation of landforms from air photographs of the Canadian Arctic mainland and the southern Arctic islands, she made a major contribution to the project. In the course of her work at McGill, she examined the Great Bear Lake region from air photographs and became interested in the elevated strandlines along the north shore of the lake. In 1958 she received a grant from the Arctic Institute of North America to visit the area. The results of this investigation were so promising that after rejoining the Geographical Branch she returned to Great Bear Lake in June, 1960. It was on this lake that with her companion, Joan Goodfellow, she met her death in a canoe accident about July 8.

[J. BRIAN BIRD]

BRIAN H. J. HAYWOOD and ANDRÉ GRENIER

In August, 1960, Brian Haywood and André Grenier lost their lives on the Korok River in the extreme northeast of Quebec. Haywood was a member of the 1959–60 staff of the McGill Sub-Arctic Research Laboratory and, with Grenier as assistant, was studying the glacial geomorphology of an area between the Torngat Mountains and Ungava Bay.

Haywood was born and educated in England, graduating from the University of London in 1957 with a B.Sc. honours in geography. After completing his military service, which took him to Easter Island in the Pacific, he came to Canada from his home in Pulborough, Surrey, in May 1959, and joined the laboratory staff at Schefferville. He soon proved himself a serious research student and a competent and cheerful companion under difficult conditions in the bush. Throughout the winter he prepared for his forthcoming field work on the Korok River and undertook original research in the expansion and contraction of the ground during freezing and thawing. To assist this work he built an ingenious instrument, known to his friends as "Haywood's bedstead" for precisely measuring ground movements at numerous discrete points, and maintained observations throughout the long sub-Arctic winter.

He proved himself a most successful member of the laboratory staff where, in addition to academic attainment, personal integrity and those elusive qualities which make up a fine character are vital. Brian left Schefferville for the field in early July well equipped to undertake a fundamental piece of research which would have assured him of a Master's degree.

Grenier was educated in Quebec and obtained his baccalaureate in 1960 from Laval University, specializing in geography. He first came to Schefferville in the summer of 1959 when he worked as an assistant in the study of terrestrial radiation and albedo of different sub-Arctic cover types. Here he made many friendships with the other members of the laboratory staff and formed a close acquaintance with Haywood which led to their joint venture the following summer. Interested in the physical properties of snow and an expert on snow shoes, he conducted winter research from Laval University and, when he applied for a regular laboratory staff position for 1960–1, his outstanding personal and academic performance of the previous summer more than assured him of a position. He returned to Schefferville in May 1960, having enthusiastically agreed to support Haywood's work on the Korok River. His appointment was part of a pattern of close French–English-Canadian co-operation which was evolving at the laboratory and it is especially to be regretted that his own valuable contribution should have terminated as it did. André was held in the highest esteem by all members of the staff and his willingness to help others would be hard to surpass.

André and Brian both had a highly critical approach to the oftentimes uncritical discipline of geography. The death of two promising research students is a severe blow to Canadian geography and the deepest personal loss to their many colleagues.

[J. D. Ives]

REVIEWS

Economic Atlas of Manitoba (edited by Thomas R. Weir), Department of Industry and Commerce, Province of Manitoba, Winnipeg, 1960. $20.00 (leatherette covered, loose-leaf binding) and $15.00 (stitched paper binding). 23¾ × 17¾ × ¾ inches.

THE PUBLICATION of a second outstanding provincial atlas within a period of four years is something about which Canadians generally, and geographers in particular, may feel justly proud. The *Economic Atlas* and its predecessor, the *British Columbia Atlas of Resources*, are outstanding among regional atlases and it is to be hoped that others of similar quality will appear in the near future. Indeed, with the exception of the *Ontario Resources Atlas*, regional atlases of any kind had been non-existent in Canada.

The *Economic Atlas of Manitoba* had its beginnings in 1956. In the fall of that year an agreement was reached between officials of the provincial government and the Geography Department, University of Manitoba, to produce an atlas comparable to that which had just appeared for British Columbia. Its purpose was to be a portrayal of the physical and cultural geography of Manitoba, including the broader patterns of resource use. Intensive preparation began in the summer of 1957, responsibility for over-all planning and map compilation resting with the Geography Department. Compilation was completed in the summer of 1959, and it is to the credit of the editor and his very limited staff that such fine results should have been achieved in so short a time. The high standard set by the compilers is matched in the quality of reproduction. Extensive use is made of photo-lithographic screens to produce a wide array of visually distinct colours, contributing much to the impressiveness of the publication.

In format, content, organization, and layout and design, the similarities between the *Economic Atlas of Manitoba* and the *British Columbia Atlas of Resources* are immediately apparent. The format of the Manitoba atlas is such that, while clearly an "outsize" publication, it is convenient to handle and yet allows the cartographer considerable flexibility in choice of scale. Half of the 37 map plates contain maps at a scale of 39 miles to the inch. Most of the remainder include maps ranging 29 to 80 miles to the inch. Those at 39-mile scale are arranged as full-page portrayals and give coverage to the entire province. Most of the others contain maps grouped either four-to-a-page or six-to-a-page. Of these, the former represent the whole province at 80-mile scale, the latter cover only the southern third of the province at 47 miles to the inch. All are on the Lambert conformal conic projection (standard parallels 47° 30′ and 65° 30′) and are derived from the 20-mile map of Manitoba prepared by the Provincial Surveys Branch.

As in the British Columbia atlas, a page of text accompanies each map page. This is a most useful means of explaining and amplifying the patterns revealed in the maps and provides an excellent opportunity for the integration of supplementary photographs, graphs, and tabular data. In a few instances, the type size employed for graphs and tabular data may be criticized as too small, and one or two of the text pages appear to have been set in bolder face than the others. These, however, must certainly be regarded as very minor flaws.

Part One of the atlas is titled "Resource Base" and consists of the physical elements —maps of hydrology, surface morphology, soils, climate, and vegetation. One of the more interesting inclusions in this section is a map showing gravity anomalies and suggesting, perhaps, the existence of an orogenic belt extending from Lake Winnipegosis to Hudson Bay. While probably of

greater appeal to the scientist than to the lay public, this map offers a provocative insight into the geophysics of Manitoba.

Part Two deals with population and settlement. Rural population is represented by a dot distribution map which, employing a dot value of 25 persons, exhibits a simple but effective pattern. The map of urban settlement is less successful. It classifies population according to the numerical size of nucleation, each size category being shown by a particular type size and colour. While the variation in type provides some basis for distinction, the use of different colours is questionable in view of the superiority of alternative techniques. The six maps showing sequent occupance of Manitoba, from the date of its entry into Confederation up to 1921, are the culmination of painstaking research that included perusal of homestead records. In combination with the two maps following, showing routes of travel and nuclei of settlement prior to 1870, and the post-1870 expansion of the railway net, they provide a most effective and interesting summary of the historical geography of Manitoba. Recent population trends (1941–56) are shown by township, the smallest non-urban areal units for which census data are available. As one would expect, the general decline in rural population and corresponding increase in urban growth is clearly apparent, but something of the detailed pattern of change stemming from advances in agricultural technology and readjustment to the settlement frontier is also revealed. Population density maps for both rural and total population, are likewise compiled on the basis of township data. Together with the well-organized accompanying text, these maps make a most useful and readable contribution to the understanding of Manitoba's population pattern. Much valuable information is also given concerning racial composition of the population and the distribution and relative importance of the major ethnic groups. With one's cartographic appetite whetted by the inclusion of such material, one wishes for additional and equally important cultural patterns, such as a regional analysis of the labour force by industry.

To this reviewer, the arrangement of contents under Part Two lacks the cohesion demonstrated in Part One. Unity might have been improved by placing the historical patterns first in the sequence, to be followed by contemporary aspects of population, rather than intermixing the two.

Half of the atlas contents is included in Part Three—Resource Use. Here again, one sees a reflection of the *British Columbia Atlas of Resources*. Appropriately, agricultural geography receives greater emphasis, some seven plates containing 37 individual maps being devoted to this topic. Included are maps showing farm size and change in size, crop and livestock densities, value of machinery per farm, average gross income per farm, farm tenure, and similar distributions based on 1951 and 1956 census data and sufficient in number and diversity to satisfy the most avid agricultural geographer. Among the remaining maps in Part Three possibly the least effective is the composite showing mines and mineral production. Such phenomena are generally difficult to render in easily readable graphic form and one wonders if, perhaps, the separation of data on two or more maps might have facilitated reader comprehension.

The inclusion of four maps of metropolitan Winnipeg is a most useful addition to the atlas and a feature notably absent from the British Columbia Atlas. Patterns of daytime population density, land use, urban growth, and types of manufacturing are shown, of which the first is of unusual interest. Based upon three summers' field work by the editor and a research team from the Geographical Branch, Ottawa, this map portrays, for individual city blocks, seven categories of daytime population density, ranging from under 10 to over 500 persons per acre. The functional classification of Winnipeg's daytime population is developed in the map of land use areas, which provides a most effective companion-piece.

Mechanically, the *Economic Atlas of Manitoba* is well-designed and skilfully executed. The problems of colour registry, especially formidable in reproductions involving several colour plates, have been almost entirely overcome. Plate 14 being the only exception apparent in the review-

er's copy. Such a minor exception can only be taken as a tribute to the general success and over-all excellence of the reproduction. More serious objections may be raised in the matter of atlas cost. While clearly intended to appeal to a wide range of public, and while potentially a most effective vehicle for the dissemination of information about the province, the Manitoba atlas is a costly item. Few students and fewer casual purchasers will find the price sufficiently attractive, even for the paperbound edition.

Whatever criticisms may be raised about its cost, the *Economic Atlas of Manitoba* is unquestionably a superb accomplishment, technically and cartographically. Its 81 pages contain a wealth of information of substantial interest, value, and utility to the general public as well as to the businessman and the professional geographer. It reflects great credit upon its makers and upon the status of Canadian geography as a whole. The precedent for content and quality set by this atlas, and that for British Columbia, is one that other provinces might do well to follow.

[A. L. FARLEY]

Antarctica, The Story of a Continent, by FRANK DEBENHAM: Macmillan Co., New York, 1961. 264 pp., illustr.

GEOGRAPHERS HAVE BEEN well represented in antarctic exploration and research. When the South Pole station was first occupied during the I.G.Y., its joint commanders (one civilian and one naval) were two American geographers, Paul Siple and Jack Tuck. Almost fifty years before, two members of the antarctic expedition led by Captain Robert F. Scott were, or later became, geographers—Griffith Taylor and Frank Debenham. The latter, after retiring as Professor of Geography at Cambridge University, has now published a book on the Antarctic that should be of particular interest to members of the profession. It contains a compact but well-chosen history of antarctic exploration and research, and a very useful survey of the continent's physical geography. These are written in an engaging style, and the author effectively introduces poetry when it helps his purpose.

Anyone essaying the task of summarizing the historical record is open to criticism for national prejudice or unfair selection. In this case the author does very well. He clearly admires Captain James Cook very highly and stresses the extraordinary bad luck that prevented him from seeing a part of the great southern continent that he did so much to cut down to size on the maps of his time. There is equal admiration for another naval officer who followed in Cook's wake forty years later. He too missed seeing the continent, but his charting of what he did see was accurate enough to be employed by the British Admiralty a century later. He was Captain Thaddeus Bellingshausen of the Russian Navy. Present-day Soviet activities in Antarctica—and they are second only to those of the United States in size and complexity—are in a real sense a continuation of those of more than a century before. Two of the present Soviet scientific stations are named after Bellingshausen's vessels "Vostok" and "Mirnyi." Far more difficult to discuss with complete balance are the rival claims to the first sighting of the continent of the British and United States sealers. Twenty years ago strong words were exchanged on this topic between geographers on both sides of the Atlantic, but Debenham wisely does not become embroiled in this. While not granting the claims of Captain Nat. Palmer to priority he does describe in detail his enterprising probing of the pack ice in search of something more substantial than seals.

In discussing a much later stage of pioneer exploration, Professor Debenham stresses the transcontinental flight of Lincoln Ellsworth and Herbert Hollick-Kenyon (a Canadian bush pilot) who in 1935 covered the long distance between Graham Land and the site of "Little America" under very hazardous conditions. They landed four times on the polar plateau and completed the last few miles on foot.

The reader is very much struck by the contrasts between the old and the new in polar work—particularly in the size and complexity of the more recent expeditions. When Byrd first landed in Antarctica in 1928 he had a party of 42 men, five of

whom were radio operators. About half of the party were non-scientists; they were there to provide the necessary "services." This started the U.S. tradition by which scientists were not called on to aid in the housekeeping or to man their own transport. The peak in massive logistics and the presence of professional "housekeepers" was reached with the U.S. Navy's "Operation Highjump" of 1946 when no less than 5,000 men were sent to Antarctica, a very small fraction of them scientists. The permanent results of this onslaught were proportionately minuscule. One of the great contributions of I.G.Y. was to restore the balance, and to return the scientists to a central place as the main reason for the highly elaborate and expensive logistics.

In a chapter entitled "A look at the Continent," the author does a useful service by giving an interestingly written account of the geological structure of Antarctica, the overlying ice-cap and its dynamics, the shelf ice, the massive tabular ice-bergs and the surrounding seas. He sketches in the main features of its extraordinarily stormy weather and the influence this has on other parts of the southern hemisphere.

A topic rarely dealt with in expedition books (although Paul Siple did not avoid the issue in "90 Degrees South") concerns the selection of suitable personnel for polar scientific work and the best ways of assuring a friendly, co-operative, and productive period of isolation. Professor Debenham believes that success lies with those who have work that needs to be done, who are keenly interested in being there to do it, and who also have the saving graces of humour and thoughtfulness for the foibles of others.

Altogether, this is a book well worth study by geographers, and is certainly one of the best on the subject for the general reader.

[TREVOR LLOYD]

TITLES and ABSTRACTS

TITLES AND ABSTRACTS OF PAPERS PRESENTED AT THE 10TH ANNUAL MEETING OF THE CANADIAN ASSOCIATION OF GEOGRAPHERS, QUEEN'S UNIVERSITY, KINGSTON, ONTARIO, 2–4 JUNE, 1960*

W. A. BLACK: GEOGRAPHICAL BRANCH PROGRAM OF ICE SURVEYS IN THE GULF OF ST. LAWRENCE, 1956 TO 1960

The Gulf of St. Lawrence ice survey was begun in 1956 to determine the nature and amount of ice in the gulf. By 1958, recording and observing techniques had become sufficiently refined that the scope of the survey and the organization of the reports became standardized. In 1959 the survey was expanded to include the St. Lawrence River.

The primary objective of the annual survey is to relate ice distribution to climatic factors. The long-term objective is the development of climatological ice studies to provide a continuing record of ice and climatic conditions of practical value to navigation.

J. D. CHAPMAN: THE GEOGRAPHY OF ENERGY: AN EMERGING FIELD OF STUDY

JEAN DESMEULES: LE PAYSAGE DOMICILIAIRE DE SAINTE-FOY, PREMIÈRE VILLE-DORTOIR DU GRAND QUÉBEC

Ste-Foy, situated seven miles west of Quebec, was rural until 1953. Since that time the large farms of the area have been sold and then subdivided into building lots. Today Ste-Foy with a population of 30,000 has a totally residential landscape. Family houses have been built in all quarters except to the east of the city where apartment buildings are prevalent.

Ten residential sections are distinguishable in this city. Each is differentiated by its situation, the value of its houses, and the social classes who inhabit them. In 1959, these sections contained about 23,000 of the 30,000 inhabitants of Ste-Foy.

The zoning by-laws of 1958 divided Ste-

*Titles only are given for those papers which have been or will be published in the *Canadian Geographer*.

Foy into four clearly marked areas—residential, commercial, industrial, and public. The residential areas are in turn divided into four distinct zones: (1) self-contained houses, (2) duplex and semi-detached houses, (3) areas in which (1) and (2) are mixed with triplexes, and, (4) (1), (2), and (3), along with apartment houses.

According to the municipal valuation of 1958, all the family dwellings are classified according to: (1) the year of construction, e.g. 1955–6—16%, (2) type of construction material, e.g. brick—50%, (3) number of families per dwelling, e.g. an only—80%, (4) number of rooms per family, e.g. 6 rooms—30%, (5) number of persons per dwelling, e.g. 4 persons—23%. A study of the land-use map shows that 45% of the 7,281 acres of the development are not yet built on.

The major road-arteries, i.e. those built before 1953, with rare exceptions form the commercial streets. Industrial developments are found on both the north and south sides of St-Foy.

JACQUES GIRARD: LES INDUSTRIES DE TRANSFORMATION DE LA PROVINCE DE QUÉBEC, 1841–1914

Au cours de la période 1841–1914, notre pays, à la suite d'une série d'événements économiques et politiques, a vu s'amorcer un développement industriel plus intensif. La province de Québec, à cause d'une situation avantageuse, a pris une part importante dans ce mouvement.

Le nombre d'employés dans l'industrie de transformation est passé de 66,000 en 1870 à 158,000 en 1910 (une augmentation de 124%) et la valeur brute de la production de $77,000,000 en 1870 à $351,000,000 en 1910 (une augmentation de 355%). De l'ensemble manufacturier, 75%, tant du nombre d'établissements que du nombre d'employés et de la valeur brute de la production, étaient pris par les groupes des aliments et boissons, du bois et ses produits, du vêtement, du cuir et ses produits, et des produits du fer et de l'acier.

Ces établissements manufacturiers étaient, pour la plupart, de modestes entreprises, qui, dans l'ensemble, ne nécessitaient pas d'importants capitaux et une main-d'œuvre très exercée. Les premières à se développer le plus intensément furent celles qui disposaient d'une abondante matière première (moulins à farine, scieries, etc.) ou d'un marché local satisfaisant (boulangeries, vêtements, forges, etc.). D'autres industries plus importantes (coton, fonderies et machines, etc.) individuellement profitèrent de la présence d'une main-d'œuvre nombreuse et peu dispendieuse et des besoins d'un marché sans cesse croissant.

La croissance de la population, le développement des voies de communications, l'ouverture de l'ouest canadien, des barrières tarifaires, l'avancement des connaissances technologiques, l'apport de capitaux étrangers furent autant de facteurs déterminants de cette période.

Enfin les industries de transformation furent responsables de la croissance de villes engendrées par le commerce et l'apparition d'un certain nombre d'autres centres sur la carte.

LOUIS-EDMOND HAMELIN: RAOUL BLANCHARD'S GEOGRAPHY

THEO L. HILLS: BRITISH GUIANA AND THE MYTH OF ELDORADO

H. A. HOSSÉ: OTTAWA'S GREENBELT AND ITS ANTICIPATED EFFECTS

DONALD Q. INNIS: THE EFFICIENCY OF JAMAICAN PEASANT LAND USE

JOHN L. JENNESS: TRANSPORTATION IN THE NORTH

Nearly all the industrial settlement in northern Canada has evolved from, or is within reach of five arteries leading into the area from Southern Canada. Since the advent of air transportation, travel is no longer route-bound and inflexible; exploration for economic resources can now extend to the remotest islands of the Arctic Archipelago. Development, however, will be restricted to a few high value–low bulk minerals unless alternative cheaper forms of transportation are made available. The government is pressing forward with extension of the transportation network, but it is faced with a number of technical and, more particularly, economic problems. It will have to take some calculated risks, or be forced to accept little progress in its plans to develop the north. Without such progress, the country as a whole will be the ultimate loser.

M. DE LAFERRÈRE : GÉOGRAPHIE ET AMÉNAGEMENT DU TERRITOIRE

Le but de la *Géographie* est la description rationnelle de l'espace accessible aux groupes humains.

L'Aménagement du territoire a pour objectif une localisation rationnelle des équipements nécessaires à la vie et à la croissance des groupes humains.

Il semble donc que dans tout projet d'aménagement du territoire doivent prendre place des études géographiques ayant l'avantage de décrire le milieu que l'on veut modifier.

D'une manière plus précise, quelle est la

nature de l'apport du géographe à l'aménagement du territoire ?

Par ses méthodes d'analyse des milieux (qui recherchent les combinaisons de phénomènes physiques, biologiques ou humains donnant leur physionomie aux paysages et leur unité aux régions) et par sa connaissance du caractère hétérogène de l'espace accessible aux groupes humains, le géographe peut :

1) apprécier, dans un territoire donné, la rigueur de certaines combinaisons fondamentales, leur extension, leur évolution spontanée, et les articulations essentielles qui permettent de modifier cette évolution.

2) assurer, dans une équipe de spécialization, les liaisons nécessaires entre les ingénieurs responsables des études techniques, les économistes qui calculent la rentabilité des opérations et les sociologues qui prévoient les comportements des groupes humains.

ARLEIGH H. LAYCOCK: HYDRO-METEOROLOGY IN WATERSHED PLANNING ON THE EASTERN SLOPES OF THE CANADIAN ROCKIES

The mountain and foothill regions of the north and south Saskatchewan river basins contribute well over ¾ of the flow of these rivers in the drier years. Watershed management to provide water yield, regime and quality improvement, erosion and flood control, is becoming increasingly necessary. This was recognized in 1947 when the Federal and Provincial Governments joinly established the Eastern Rockies Forest Conservation Board to protect and improve watershed conditions in a large part of this mountain and foothill area.

The problems of the watershed regions and the possibilities for improvement, vary largely with the patterns of precipitation and evapotranspiration. These in turn vary greatly from back range to foothill and from southern to northern areas. Effective management must be based upon an understanding of these and other physical and cultural patterns. With such understanding it should be possible for management to adopt positive policies of watershed protection and improvement. The present negative policy of limiting other use only if damage resulting from it is believed to be "excessive" must be replaced.

J. ROSS MACKAY: A STUDY OF FREEZE-UP AND BREAK-UP AT FORT GOOD HOPE, N.W.T.

Fort Good Hope freeze-up and break-up records, which go back to 1876, are the longest for the Mackenzie Valley and predate some of the earliest climatic records in Canada. These records are therefore of considerable value in the study of variations in climatic conditions, as reflected by fluctuations in freeze-up and break-up. The records have been analysed by standard statistical methods to determine: (1) long-term variations in freeze-up and break-up; and (2) the effect of environmental factors, primarily air temperature, upon freeze-up and break-up.

Statistically important variations in length of open season have occurred since 1876 with the "coldest" period being 1896–1905, and the "warmest" 1936–55. Significant correlations have been obtained by multiple regression analysis between freeze-up and break-up at Ford Good Hope and preceding temperatures at Fort Simpson, 477 miles upstream. The first movement of ice at Ford Good Hope may be used to estimate the passage of main Mackenzie River ice at Reindeer Station about two weeks later and some 300 miles downstream.

GORDON MERRILL: RECENT LAND DEVELOPMENT IN COASTAL BRITISH GUIANA

GEORGE H. MICHIE: VALIJOKI AND LISMA: NEW PLANNED SETTLEMENT IN FINNISH LAPLAND

S. NIEUWOLT: LOCATING THE CENTRAL BUSINESS DISTRICT OF VIENNA

The central business district of any city can generally be defined as that part where the central functions prevail and where, consequently, other functions have no great importance.

To locate and delimit the central business district of Vienna, it was necessary to use the method of field-mapping, as no sufficient statistics were available. Two central functions were mapped: *retail-stores* and *offices*.

To simplify the field work, retail stores were not mapped separately, but collectively, as *shopping streets*. The pattern of main and secondary shopping streets in Vienna shows a clear concentration in the Old Town (approximately within the former mediaeval walls) and along a few of the most important radial streets.

The map of *offices* shows a concentration in the same parts of the town, in some cases even in the same streets. Here are generally found the *retail stores* using only the lower parts of the buildings, with the offices on the higher storeys. One function is located on top of the other. Some parts of the Old Town, where no shopping streets are found, are specialized for governmental offices.

The map of the *density of the population* shows clearly a central area of lower densities as compared with the main residential areas.

The central business district can be located as the area of Vienna where shopping streets and offices are concentrated and where the density of the population (residential) is relatively low. The boundaries are quite clear: the Old City stands out, but the central business district has spread out, along the most important radial streets into the general zone of mainly residential areas.

J. G. POTTER: CHANGES IN SEASONAL SNOWFALL IN CITIES

VICTOR W. SIM: LATE WISCONSIN GLACIATION IN MELVILLE PENINSULA, N.W.T.

MORLEY K. THOMAS: CANADIAN ARCTIC TEMPERATURES

Canadian Arctic areas are more maritime than continental in nature. The Arctic winter is extremely cold: the annual temperature curve reaches a minimum about March 1 on the islands, but record low temperatures are not so extremely low as those reported from the sub-Arctic. By our southern standards, summer barely occurs each year and the diurnal temperature curve is pronounced only in the spring. Wind-chill averages are higher to the west of Hudson Bay than in the far north, but the accumulation of heating degree days is the greatest on the northern islands. Although the period of record is short, a rising temperature trend has been observed in the Arctic reaching a maximum late in the decade of the 1940's. Climatic data from the Eurasian Arctic are given for comparative purposes throughout the paper.

HARRY V. WARREN, F.R.S.C.: SOME PERTINENT FACTORS ON ENERGY STUDIES

ROY I. WOLFE: ONE GEOGRAPHER'S ROLE IN HIGHWAY PLANNING

Highway planning offers considerable scope for the use of geographic skills in all their variety. Experience has shown that engineers, to whom highways are primarily lines joining one place to another, willingly look to geographers for guidance in interpreting the relations between these lines and the areas they are intended to serve. Thus, in comprehensive, province-wide studies of future highway needs, in regional surveys, and in evaluations of requests for the construction of new roads, a great variety of geographic techniques have been employed to establish highway classifications, to examine rural and urban land-use patterns, and to formulate policy for providing optimum highway service.

There are disadvantages for the geographer in working for an engineering department and in having to direct his investigations towards ends that are essentially non-geographic. But a large organization with its seemingly limitless resources offers distinct advantages as well. The continuing stimulation of new and interesting operational problems, added to the experience of seeing direct, tangible results of his work in the form of new highways and new lines on a map, make highway planning a most satisfying career for a geographer.

HAROLD A. WOOD: PEASANT AGRICULTURE IN NORTHERN HAITI

BOGDAN ZABORSKI: TURKIC-IRANIAN ETHNIC COMPETITION IN SOUTH-WEST AND CENTRAL ASIA

The present-day distribution of population in southwestern Asia is the result of a long evolution. A series of invasions and migrations followed each other throughout history affecting the former populations and depositing new ethnic layers.

At the end of the second millennium B.C. most of continental southwestern and central Asia was ethnically Iranian. The Iranians arrived here in the second millennium B.C. from the earlier centre of Indo-Europeans in east central Europe. The arriving Iranians probably found here an Asianitic population. Futher to the southwest, beyond Mesopotamia, there already lived a Semitic people.

The Iranian populations had a period of expansion in the first millennium B.C. when Iranian Scythians seized the Black Sea steppe and temporarily invaded even the basin of the Vistula River (about 500 B.C.). The Scythians have been followed by another Iranian tribe, the Sarmatians. The Turks, between the 6th and the 9th centuries A.D., transformed the ethnic character of central Asia. The Iranian population was partly slaughtered, partly assimilated or it escaped elsewhere. Within a few generations, central Asia was assimilated to the Turkic language. Moreover, the Turks succeeded in the colonization of wide areas in southwestern Iran, Anatolia, and the eastern Caucasus. During the Arab domination of southwest Asia, the Arabs not only maintained the Arab ethnic character but also largely infiltrated Iran, and colonized the semi-desertic area of Deshte-Kewir and advanced along the coast.

The last wave of colonists, both farmers and city dwellers, is the Slavic one. This started here at the end of the 18th century, and has not yet ended.

Only the correlation of both geographic and historic methods will permit full understanding of the processes which have transformed the ethnic face of southwest and central Asia through the course of history.